

SEQUENCE LISTING

<110> Jørgensen, Steen Troels  
Rasmussen, Michael Dolberg  
Andersen, Jens Tønne  
Olesen, Peter Bjarke  
Clausen, Ib Groth

<120> Improved Bacillus Host Cell

<130> 10297.204-US

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<170> PatentIn version 3.3

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<212> DNA

<213> Bacillus licheniformis

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Lys Thr Ile Arg Gly Lys Lys Ile Ile Glu Gly Leu Ser Phe Asp Val	
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cgg gca ggc gag ata ttc ggc ttc ctg ggg ccg aac ggc gcc gga aaa	629
Arg Ala Gly Glu Ile Phe Gly Phe Leu Gly Pro Asn Gly Ala Gly Lys	
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Thr Thr Thr Ile Arg Met Ile Val Gly His Met Ser Ile Thr Ala Gly	

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Ala Arg His Ile Gly Ala Ile Val Glu Asn Pro Glu Leu Tyr Lys Phe			
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Leu Thr Gly Tyr Gln Asn Leu Gln Tyr Ala Arg Met Thr Lys Gly			
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gtg acg aaa aag aaa att gac gaa atc gtc gag ctc gtc gga ttg aaa			869
Val Thr Lys Lys Lys Ile Asp Glu Ile Val Glu Leu Val Gly Leu Lys			
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agg ctt ggc ctt gcc caa agc ctt ttg cac gat cca aag ctg ttg att			965
Arg Leu Gly Leu Ala Gln Ser Leu Leu His Asp Pro Lys Leu Leu Ile			
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ctc gat gag ccg acg aac ggg ctt gat ccg gca ggt atc ccg gaa atc			1013
Leu Asp Glu Pro Thr Asn Gly Leu Asp Pro Ala Gly Ile Arg Glu Ile			
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Val Ser Ser His Leu Leu Ser Glu Met Glu Leu Met Cys Asp Arg Ile			
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Pro Ala Arg Asp Glu Lys Lys Arg Tyr Tyr Ile Gln Ala Asp Asp Thr			
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Gln Ala Leu Thr Arg Glu Ala Ala Ala Phe Arg Lys Val Lys Val Asp			
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Glu Ala Glu Gly Gly Ile Glu Leu Ser Ile Gln Lys Asp Glu Val Pro			
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Asp Leu Ile Lys His Leu Thr Asp Ser Gly Val Arg Leu Tyr Glu Val			
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<213> Bacillus licheniformis

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Phe Gly Phe Leu Gly Pro Asn Gly Ala Gly Lys Thr Thr Thr Ile Arg  
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Met Ile Val Gly His Met Ser Ile Thr Ala Gly Glu Ile Ala Val Cys  
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Gly Val Ser Val Lys Glu Asn Phe Glu Lys Ala Ala Arg His Ile Gly  
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Ala Ile Val Glu Asn Pro Glu Leu Tyr Lys Phe Leu Thr Gly Tyr Gln  
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Asn Leu Gln Gln Tyr Ala Arg Met Thr Lys Gly Val Thr Lys Lys Lys  
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Gln Ser Leu Leu His Asp Pro Lys Leu Leu Ile Leu Asp Glu Pro Thr  
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Asn Gly Leu Asp Pro Ala Gly Ile Arg Glu Ile Arg Asp Tyr Leu Arg  
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Lys Leu Thr Arg Glu Lys Gly Met Ala Val Ile Val Ser Ser His Leu  
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Leu Ser Glu Met Glu Leu Met Cys Asp Arg Ile Ala Ile Ile Gln Asn  
 195 200 205

Gly Lys Leu Arg Asp Ile Gln His Val His Gly Pro Ala Arg Asp Glu  
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Lys Lys Arg Tyr Tyr Ile Gln Ala Asp Asp Thr Gln Ala Leu Thr Arg  
 225 230 235 240

Glu Ala Ala Ala Phe Arg Lys Val Lys Val Asp Glu Ala Glu Gly Gly  
 245 250 255

Ile Glu Leu Ser Ile Gln Lys Asp Glu Val Pro Asp Leu Ile Lys His  
 260 265 270

Leu Thr Asp Ser Gly Val Arg Leu Tyr Glu Val Lys Ala Val Asn Lys  
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Gln His Val  
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Gly Ser Gln His Ile Gly Met Gly His Glu Leu Tyr Glu Lys Glu Pro	
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aat gcg aag aag att ttt gaa gaa gcg gat caa acg ctt gaa aca aaa	629
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ctg agc acc ctc atg ttt gaa ggg gat gca aag gaa ctg acg ctt aca	677
Leu Ser Thr Leu Met Phe Glu Gly Asp Ala Lys Glu Leu Thr Leu Thr	
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Tyr Asn Ala Gln Pro Ser Leu Leu Thr Ala Ser Ile Ala Ala Leu Glu	
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ctc ggc gaa tac agc gca ttg gtc gct gcc ggc gcc ttg tcg ttt aaa	821
Leu Gly Glu Tyr Ser Ala Leu Val Ala Ala Gly Ala Leu Ser Phe Lys	
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Gln Ala Leu Lys Glu Val Thr Asp Lys Ile Ser Glu Glu Gly Asn Leu	
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Leu	Met	Lys	Pro	Ala	Ala	Asp	Lys	Leu	Arg	Glu	Val	Leu	Asp	Ala	Cys	
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Phe	Val	Thr	Asp	Lys	Asp	Asp	Ile	Lys	Asn	Lys	Leu	Ile	Glu	Gln	Leu	
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Tyr	Ser	Pro	Val	Arg	Phe	Glu	Glu	Thr	Ile	Ser	Arg	Leu	Ile	Asp	Glu	
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Pro	Asn	Thr	Ile	Glu	Leu	Ala	Val	Gln	Thr	Leu	Lys	Glu	Glu	Asn	Glu	
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Asn	Ala	Gly	Lys													
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Phe Glu Gly Asp Ala Lys Glu Leu Thr Leu Thr Tyr Asn Ala Gln Pro  
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Ser Leu Leu Thr Ala Ser Ile Ala Ala Leu Glu Lys Leu Lys Glu Tyr  
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Gly Ile Lys Ala Asp Tyr Ala Ala Gly His Ser Leu Gly Glu Tyr Ser  
85 90 95

Ala Leu Val Ala Ala Gly Ala Leu Ser Phe Lys Asp Ala Val Tyr Ala  
100 105 110

Val Arg Lys Arg Gly Glu Phe Met Asn Glu Ala Val Pro Ala Gly Glu  
115 120 125

Gly Ala Met Ala Ala Ile Leu Gly Met Asp Ser Gln Ala Leu Lys Glu  
130 135 140

Val Thr Asp Lys Ile Ser Glu Glu Gly Asn Leu Val Gln Leu Ala Asn  
145 150 155 160

Leu Asn Cys Pro Gly Gln Ile Val Ile Ser Gly Thr Ala Lys Gly Val  
165 170 175

Glu Leu Ala Ser Glu Leu Ala Lys Glu Lys Gly Ala Lys Arg Ala Ile  
180 185 190

Pro Leu Glu Val Ser Gly Pro Phe His Ser Glu Leu Met Lys Pro Ala  
 195 200 205

Ala Asp Lys Leu Arg Glu Val Leu Asp Ala Cys Thr Ile Asn Asp Ala  
 210 215 220

Ala Ile Pro Val Val Ser Asn Val Thr Ala Asp Phe Val Thr Asp Lys  
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Asp Asp Ile Lys Asn Lys Leu Ile Glu Gln Leu Tyr Ser Pro Val Arg  
 245 250 255

Phe Glu Glu Thr Ile Ser Arg Leu Ile Asp Glu Gly Val Thr Thr Phe  
 260 265 270

Ile Glu Ile Gly Pro Gly Lys Val Leu Ser Gly Leu Val Lys Lys Val  
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Asn Arg Arg Val Lys Thr Ile Ala Val Ser Asp Pro Asn Thr Ile Glu  
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Gly Ala Leu Ser Pro Leu Gly Asn Asp Val Lys Thr Ser Trp Asn Asn												
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gcg atc aac ggg gtt tcc gga gtc ggc ccg ata aca agg gtg aac gcg												509
Ala Ile Asn Gly Val Ser Gly Val Gly Pro Ile Thr Arg Val Asn Ala												
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Asp Glu Tyr Pro Ala Lys Val Ala Ala Glu Leu Lys Asp Phe Lys Ile												
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Glu Asp Tyr Met Asp Lys Lys Glu Ala Arg Lys Met Asp Arg Phe Thr												
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caa tat gcc gtt gtg tcg gcg aaa atg gcc gtg gaa gac gcg ggc ctc												653
Gln Tyr Ala Val Val Ser Ala Lys Met Ala Val Glu Asp Ala Gly Leu												
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gac att aac gaa agc aac gca gac cgg atc ggc gtc tgg gtc ggt tcc												701
Asp Ile Asn Glu Ser Asn Ala Asp Arg Ile Gly Val Trp Val Gly Ser												
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gga atc ggc ggc ctt gaa acg ctt gaa cag cag ttc gaa aca ttt tta												749
Gly Ile Gly Gly Leu Glu Thr Leu Glu Gln Gln Phe Glu Thr Phe Leu												
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aca aaa gga ccg cgg cgc gtc agc ccg ttc ttt gta ccg atg atg att												797
Thr Lys Gly Pro Arg Arg Val Ser Pro Phe Phe Val Pro Met Met Ile												
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cct gat atg gcg acc ggc cag att tcg atc tct ctc ggt gca aaa ggg												845
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				175						180		185
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Ser Gly Gly Thr Glu Ala Pro Leu Thr Arg Met Ser Phe Ala Gly Phe												
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tca gcc aat aaa gcg cta tcc act aat ccg gat ccg aaa acg gca agc												1037
Ser Ala Asn Lys Ala Leu Ser Thr Asn Pro Asp Pro Lys Thr Ala Ser												
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Arg Pro Phe Asp Lys Asn Arg Asp Gly Phe Val Met Gly Glu Gly Ala												

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Thr Ile Tyr Ala Glu Val Val Gly Tyr Gly Ser Thr Gly Asp Ala Tyr				
	255	260	265	
cat att acg gca cct gcg cca aat gga gaa ggc ggc gtc aga gcc atg				1229
His Ile Thr Ala Pro Ala Pro Asn Gly Glu Gly Gly Val Arg Ala Met				
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Lys Glu Ala Ile Lys Asp Ala Gly Leu Ser Pro Val Asp Ile Asp Tyr				
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Ile Asn Ala His Gly Thr Ser Thr Pro Tyr Asn Asp Lys Phe Glu Thr				
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atc gcc att aaa gaa gtg ttc gga gag cat gcc tac aag ctt gcc gtc				1373
Ile Ala Ile Lys Glu Val Phe Gly Glu His Ala Tyr Lys Leu Ala Val				
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agc tcg aca aaa tcg atg aca ggg cac ttg ctc ggg gct gcc gga ggc				1421
Ser Ser Thr Lys Ser Met Thr Gly His Leu Leu Gly Ala Ala Gly Gly				
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Pro Thr Ile Asn Ile Glu Thr Pro Asp Glu Asp Cys Asp Leu Asp Tyr				
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Val Pro Asp Gln Ala Arg Arg Gln Asp Val Asn Val Val Leu Ser Asn				
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tcg ctt ggt ttc ggc gga cac aac gca acg ctg atc ttc aaa aaa tat				1613
Ser Leu Gly Phe Gly Gly His Asn Ala Thr Leu Ile Phe Lys Lys Tyr				
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Glu				
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35 40 45

Lys Val Ala Ala Glu Leu Lys Asp Phe Lys Ile Glu Asp Tyr Met Asp  
50 55 60

Lys Lys Glu Ala Arg Lys Met Asp Arg Phe Thr Gln Tyr Ala Val Val  
65 70 75 80

Ser Ala Lys Met Ala Val Glu Asp Ala Gly Leu Asp Ile Asn Glu Ser  
85 90 95

Asn Ala Asp Arg Ile Gly Val Trp Val Gly Ser Gly Ile Gly Gly Leu  
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Glu Thr Leu Glu Gln Gln Phe Glu Thr Phe Leu Thr Lys Gly Pro Arg  
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Arg Val Ser Pro Phe Phe Val Pro Met Met Ile Pro Asp Met Ala Thr  
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Gly Gln Ile Ser Ile Ser Leu Gly Ala Lys Gly Val Asn Ser Cys Thr  
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Val Thr Ala Cys Ala Thr Gly Thr Asn Ser Ile Gly Asp Ala Phe Lys  
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Val Ile Gln Arg Gly Asp Ala Asp Val Met Ile Ser Gly Gly Thr Glu  
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Ala Pro Leu Thr Arg Met Ser Phe Ala Gly Phe Ser Ala Asn Lys Ala  
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Leu Ser Thr Asn Pro Asp Pro Lys Thr Ala Ser Arg Pro Phe Asp Lys  
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Asn Arg Asp Gly Phe Val Met Gly Glu Gly Ala Gly Ile Val Val Leu  
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Glu Glu Leu Glu His Ala Leu Asn Arg Gly Ala Thr Ile Tyr Ala Glu  
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Val Val Gly Tyr Gly Ser Thr Gly Asp Ala Tyr His Ile Thr Ala Pro  
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Ala Pro Asn Gly Glu Gly Gly Val Arg Ala Met Lys Glu Ala Ile Lys  
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Asp Ala Gly Leu Ser Pro Val Asp Ile Asp Tyr Ile Asn Ala His Gly  
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Thr Ser Thr Pro Tyr Asn Asp Lys Phe Glu Thr Ile Ala Ile Lys Glu  
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Val Phe Gly Glu His Ala Tyr Lys Leu Ala Val Ser Ser Thr Lys Ser  
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Met Thr Gly His Leu Leu Gly Ala Ala Gly Gly Ile Glu Ala Ile Phe  
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Ser Val Leu Ala Ile Lys Glu Gly Ile Ile Pro Pro Thr Ile Asn Ile  
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Glu Thr Pro Asp Glu Asp Cys Asp Leu Asp Tyr Val Pro Asp Gln Ala  
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Arg Arg Gln Asp Val Asn Val Val Leu Ser Asn Ser Leu Gly Phe Gly

385

390

395

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Gly His Asn Ala Thr Leu Ile Phe Lys Lys Tyr Glu  
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&lt;210&gt; 7

&lt;211&gt; 8158

&lt;212&gt; DNA

&lt;213&gt; Bacillus licheniformis

&lt;220&gt;

&lt;221&gt; CDS

&lt;222&gt; (501)..(7655)

&lt;400&gt; 7

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gacagcgaaa atttgatcta ccggggaatt gattccgtga gaatcatgag tctcgcagag      360
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Asp Gln Glu Leu Phe Glu Lys Ala Leu Arg His Val Ile Lys Glu Ala
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Glu Ile Val Pro Ser Thr Asp Phe Pro Leu His Tyr Ile Asp Val Ser
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Leu Phe Lys Ala Ala Gln Asp His Tyr Phe Trp Tyr Gln Arg Thr His	
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His Ile Ala Thr Asp Gly Phe Ser Phe Thr Leu Ile Ala Glu Arg Leu	
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Ser Lys Ile Tyr Thr Ala Leu Met Gln Asn Lys Ser Ile Asp Gln Ser	
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Glu Thr Val Met Ala Ala Ala Ala Ile Tyr Val His Arg Leu Thr Gly	
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Ala Asn Asp Val Val Leu Gly Met Pro Met Met Cys Arg Leu Gly Ser	
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Ala Ala Leu His Ile Pro Gly Met Val Met Asn Leu Leu Pro Leu Arg	
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Gly Cys Gln Gly Ile Val His Asn Leu Ala Thr Gly Pro Val Asp Asp	
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Asn Met Asp Ala Asn Pro Ala Val Tyr His Ala Asp Glu Leu Glu Asp	
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His Gly Asn Arg Phe Leu Thr Leu Leu Lys Thr Ile Ala Val Cys Glu	
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Gln Thr Gln Pro Val Gly Thr Leu Asp Ile Leu Leu Pro Glu Glu Arg	
430 435 440	
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Ser Pro Ala Val Val Cys Asn Asp Lys Val Leu Thr Tyr Ser Glu Leu	
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Lys Pro Glu Thr Phe Ile Ala Leu Ala Leu Pro Arg Ser Ala Glu Met	
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Ile Asp Pro Asp Tyr Pro Ala Asp Arg Ile Glu Tyr Met Leu Asn Asp	
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Gly Ser Gln Met Pro Lys Leu Ile Leu Asp Glu Gln Thr Val Met Glu	
575 580 585	
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Lys Met Ser Gly Cys Ser Glu Glu Asn Pro Gly Glu Gln His Ser Gly	
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Lys Gly Val Val Val Gln Ala Glu Ser Leu Phe Asn Phe Leu Leu Ser	
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Ile Ser Gly Ser Ala Val Val Leu Ala Glu Lys Glu Thr Val Gln Asp	
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Pro Ser Glu Leu Ala Lys Met Ile Glu Thr Tyr Glu Ile Thr Ile Met	
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Lys Leu Lys Gly Leu Arg Ala Leu Val Gly Gly Glu Ala Leu Gln Ser	
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Tyr Gly Pro Thr Glu Thr Thr Ile Trp Ser Thr Ala Ala Ala Leu Glu	
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Gly Asn Cys Thr Glu Pro Pro Gly Ile Gly Cys Ala Ile Trp Asn Thr	



765	770	775	
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Gln Leu Tyr Val Leu Asp Ala Gly Leu Gln Pro Val Pro Pro Gly Thr			
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Ala Gly Glu Leu Tyr Val Ala Gly Thr Gly Val Ala Arg Gly Tyr Leu			
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Asn Arg His Ala Leu Thr Ala Glu Arg Phe Ile Ala Asn Pro Tyr Gly			
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Pro Pro Gly Ser Arg Met Tyr Arg Thr Gly Asp Ile Val Arg Trp Arg			
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Glu Asp Gly Ser Leu Asp Tyr Ile Gly Arg Ala Asp His Gln Val Lys			
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Ile Arg Gly Phe Arg Ile Glu Met Gly Glu Ile Glu Ala Val Leu Ala			
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Pro Gly Asp Pro Arg Leu Phe Ala Tyr Ala Val Pro Ala Ser Gly Glu			
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Ser Leu Asp Pro Ala Glu Leu Arg Arg Phe Val Gly Glu Thr Leu Pro			
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Asp Tyr Met Ile Pro Ser Ala Phe Val Ile Leu Asp Glu Leu Pro Leu			
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Thr Pro Asn Gly Lys Leu Asp Arg Lys Ser Leu Pro Ala Pro Ala Val			
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Ser Met His Thr Gly Gly Arg Glu Pro Arg Thr Pro Gln Glu Glu Ile			
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	990	995	1000

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Ala Ala Leu Gly Asp Val Ala Thr Arg His Glu Pro Leu Arg Thr	
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His Glu Leu Glu Lys Val Leu Ala Glu Ala Val Arg His Arg Tyr	
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His Leu Glu Lys Glu Pro Pro Phe Arg Ala Gln Leu Phe Val Leu	
1155 1160 1165	
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Gly Pro Asp Lys Phe Val Leu Leu Leu Leu Leu His His Met Ile	
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Ala Tyr Asn Ala Arg Leu Gln Gly Glu Ala Pro Val Trp Glu Pro	
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Leu Gly	Ser Glu	Asn Asn	Pro	Asp Ser	Leu Ile	Ala	Lys Gln	Leu	
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Gln Ser	Ala Leu	Ala Ala	Leu	Leu Thr	Arg Leu	Gly	Ala Gly	His	
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Leu Gly	Glu Ile	Val Gly	Leu	Phe Val	Asn Thr	Leu	Val Leu	Arg	
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Thr Asp	Thr Ser	Gly Asn	Pro	Ser Phe	Arg Glu	Leu	Leu Asn	Arg	
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Val Arg	Lys Val	Asn Leu	Ala	Ala Tyr	Glu His	Gln	Asp Leu	Pro	
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Phe Glu	Arg Leu	Val Glu	Val	Leu Asn	Pro Arg	Arg	Ser Arg	Ala	
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Arg His	Pro Leu	Phe Gln	Ile	Met Leu	Ala Phe	Gln	Asn Thr	Pro	
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Glu Pro	Glu Leu	Asp Leu	Ser	Gly Leu	Lys Ser	Asp	Ile Glu	Ile	
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Glu	His	Arg	Lys	Ala	Asp	Gly	Thr	Pro	Ala	Gly	Ile	Gly	Gly	Phe	
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Leu	Glu	Tyr	Ser	Thr	Asp	Leu	Phe	Glu	Arg	Asn	Thr	Val	Gln	Thr	
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Leu	Ala	Glu	Arg	Leu	Val	Arg	Leu	Leu	Asp	Ser	Ala	Ala	Asp	Asp	
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Pro	Asp	Gln	Pro	Ile	Glu	Lys	Leu	Asp	Ile	Leu	Leu	Pro	Ala	Glu	
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Asp	Pro	Glu	Ala	Val	Ala	Val	Ile	Cys	Glu	Asn	Asn	Ala	Leu	Thr	
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Tyr	Gly	Glu	Leu	Asn	Lys	Arg	Ala	Asn	Arg	Leu	Ala	His	Leu	Leu	
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Ile	Ala	Lys	Gly	Val	Gly	Pro	Glu	Gln	Phe	Ala	Ala	Leu	Ala	Leu	
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cca	aga	tct	ttg	gat	atg	gtt	gtc	gga	ttg	ctt	gca	gtg	ctg	aag	5264
Pro	Arg	Ser	Leu	Asp	Met	Val	Val	Gly	Leu	Leu	Ala	Val	Leu	Lys	
1575						1580					1585				
gct	ggc	gcg	gca	tat	gtg	ccc	cta	gat	ccg	gac	tac	ccg	gcg	gaa	5309
Ala	Gly	Ala	Ala	Tyr	Val	Pro	Leu	Asp	Pro	Asp	Tyr	Pro	Ala	Glu	
1590						1595					1600				
agg	ata	gcg	ttt	atg	ttg	aat	gat	gcc	cat	cct	gtc	tgc	atc	gta	5354
Arg	Ile	Ala	Phe	Met	Leu	Asn	Asp	Ala	His	Pro	Val	Cys	Ile	Val	
1605						1610					1615				
acg	agt	tca	gcg	gta	gaa	tca	aat	ctt	tct	gtt	ccc	gga	tct	gtt	5399
Thr	Ser	Ser	Ala	Val	Glu	Ser	Asn	Leu	Ser	Val	Pro	Gly	Ser	Val	
1620						1625					1630				
gaa	agg	att	gta	ctc	gat	gat	cct	tgt	ata	caa	gag	gaa	ctg	aaa	5444
Glu	Arg	Ile	Val	Leu	Asp	Asp	Pro	Cys	Ile	Gln	Glu	Glu	Leu	Lys	

1635	1640	1645	
gga tgc gct gct gcg aat ccg	tgt gat gcc gac cgc	acc gcg cct	5489
Gly Cys Ala Ala Ala Asn Pro	Cys Asp Ala Asp Arg	Thr Ala Pro	
1650	1655	1660	
ttg ctg cct ctt cac ccg gcg	tat gtc att tac aca	tcc ggt tcg	5534
Leu Leu Pro Leu His Pro Ala	Tyr Val Ile Tyr Thr	Ser Gly Ser	
1665	1670	1675	
acc ggc aag ccg aaa gga gtc	gtt gtt ccg cat caa	aat gtc gtg	5579
Thr Gly Lys Pro Lys Gly Val	Val Val Pro His Gln	Asn Val Val	
1680	1685	1690	
cgg ctg ttc gga gcg act gac	caa tgg ttc cat ttc	ggc gct gac	5624
Arg Leu Phe Gly Ala Thr Asp	Gln Trp Phe His Phe	Gly Ala Asp	
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gat gtt tgg acg atg ttt cat	tct tac gca ttt gac	ttt tcg gta	5669
Asp Val Trp Thr Met Phe His	Ser Tyr Ala Phe Asp	Phe Ser Val	
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tgg gaa att tgg gga gca ctt	ctc aat ggg ggc cgg	ctt atc gtg	5714
Trp Glu Ile Trp Gly Ala Leu	Leu Asn Gly Gly Arg	Leu Ile Val	
1725	1730	1735	
gtg cct cat aca atc agc cgc	tcg ccg gcc gaa ttt	ctc aat ctt	5759
Val Pro His Thr Ile Ser Arg	Ser Pro Ala Glu Phe	Leu Asn Leu	
1740	1745	1750	
ctc gtt cgc gag gga gtg act	gtg ctc aat cag act	cct tca gca	5804
Leu Val Arg Glu Gly Val Thr	Val Leu Asn Gln Thr	Pro Ser Ala	
1755	1760	1765	
ttt tat caa ttg atg cag gct	gac cgg gac aat gct	gag aca gga	5849
Phe Tyr Gln Leu Met Gln Ala	Asp Arg Asp Asn Ala	Glu Thr Gly	
1770	1775	1780	
aag ctc ctt tcc ttg cgc ttt	atc att ttt gga ggg	gaa gcg ctc	5894
Lys Leu Leu Ser Leu Arg Phe	Ile Ile Phe Gly Gly	Glu Ala Leu	
1785	1790	1795	
gag ctg aag agg ctt gaa gat	tgg tat gaa cgc cat	ccg gat cat	5939
Glu Leu Lys Arg Leu Glu Asp	Trp Tyr Glu Arg His	Pro Asp His	
1800	1805	1810	
ttc ccg cgg ctg att aat atg	tat gga att aca gaa	acg acg gtg	5984
Phe Pro Arg Leu Ile Asn Met	Tyr Gly Ile Thr Glu	Thr Thr Val	
1815	1820	1825	
cat gtc agc tat att tct ctc	gat cag cag act gcg	gca ctt caa	6029
His Val Ser Tyr Ile Ser Leu	Asp Gln Gln Thr Ala	Ala Leu Gln	
1830	1835	1840	
gcg aac agc ctg atc ggc cag	ggg att ccc gat tta	ggg gta tat	6074
Ala Asn Ser Leu Ile Gly Gln	Gly Ile Pro Asp Leu	Gly Val Tyr	
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Val Leu Asp Glu Tyr Leu Glu Pro Val Pro Pro Gly Val Thr Gly	
1860 1865 1870	
gag atg tat gtg tcc ggg ggc ggt ctc gca cgg ggt tac ttg ggc	6164
Glu Met Tyr Val Ser Gly Gly Gly Leu Ala Arg Gly Tyr Leu Gly	
1875 1880 1885	
aga ccc gat ttg aca gca gac cgc ttt gtc gct gat ccg ttt ggt	6209
Arg Pro Asp Leu Thr Ala Asp Arg Phe Val Ala Asp Pro Phe Gly	
1890 1895 1900	
ccg ccg gga acc cgg atg tac cgc acc ggc gat ctt gcc cgc agg	6254
Pro Pro Gly Thr Arg Met Tyr Arg Thr Gly Asp Leu Ala Arg Arg	
1905 1910 1915	
cgc cag gac ggc tct ctg gat tat atg ggg cgg gcc gac cag cag	6299
Arg Gln Asp Gly Ser Leu Asp Tyr Met Gly Arg Ala Asp Gln Gln	
1920 1925 1930	
atc aag atc cgc ggc ttc aga atc gaa ctc ggc gag ata gaa gcg	6344
Ile Lys Ile Arg Gly Phe Arg Ile Glu Leu Gly Glu Ile Glu Ala	
1935 1940 1945	
gtg ctt gtc cgc cat cat aga gtg aat caa gcc gct gtg gtc gta	6389
Val Leu Val Arg His His Arg Val Asn Gln Ala Ala Val Val Val	
1950 1955 1960	
agg gaa ggc cag ccc ggg gac aag cgt ctg atc gcc tac gtt gtc	6434
Arg Glu Gly Gln Pro Gly Asp Lys Arg Leu Ile Ala Tyr Val Val	
1965 1970 1975	
ccg gcg tct gaa gaa gaa acc gat ccg gct gag ctg cga cgg ttt	6479
Pro Ala Ser Glu Glu Glu Thr Asp Pro Ala Glu Leu Arg Arg Phe	
1980 1985 1990	
gcc gca ggc act ctg ccg gag tac atg gtg cct tcc gca ttt gta	6524
Ala Ala Gly Thr Leu Pro Glu Tyr Met Val Pro Ser Ala Phe Val	
1995 2000 2005	
aaa att tca gag ctg cca ttg act cca aat ggc aaa ctt gac cga	6569
Lys Ile Ser Glu Leu Pro Leu Thr Pro Asn Gly Lys Leu Asp Arg	
2010 2015 2020	
aaa gcg ctg cct gag cct gac ttt gcc gcg gct gtt aaa ggg cgg	6614
Lys Ala Leu Pro Glu Pro Asp Phe Ala Ala Ala Val Lys Gly Arg	
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ggc cca aga aca ccg cag gaa gaa atc ctg tgc gat ctt ttt tca	6659
Gly Pro Arg Thr Pro Gln Glu Glu Ile Leu Cys Asp Leu Phe Ser	
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Glu Ile Leu Asn Ala Pro Arg Val Gly Ile Asp Asp Gly Phe Phe	
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att cgt gaa gcg ctc gga gtc gaa ctc ggc atc ggc gac ctg ctt Ile Arg Glu Ala Leu Gly Val Glu Leu Gly Ile Gly Asp Leu Leu 2085 2090 2095	6794
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ggc agt caa gat ccc ctg ttc tgt gtg cac ccg gcc gga ggc ctc Gly Ser Gln Asp Pro Leu Phe Cys Val His Pro Ala Gly Gly Leu 2130 2135 2140	6929
agc tgg tgt tat gcc ggt tta atg acg gca ctc ggc aag gaa tac Ser Trp Cys Tyr Ala Gly Leu Met Thr Ala Leu Gly Lys Glu Tyr 2145 2150 2155	6974
ccg ata tac ggc ctt caa gcc cgc ggg atc gca agg cag gaa gag Pro Ile Tyr Gly Leu Gln Ala Arg Gly Ile Ala Arg Gln Glu Glu 2160 2165 2170	7019
cta cct gat acg ctc gac gac atg gct gct gat tat att cgg cac Leu Pro Asp Thr Leu Asp Asp Met Ala Ala Asp Tyr Ile Arg His 2175 2180 2185	7064
att cgt acg att cag cca aca ggc cct tat cgt ctg ctc ggc tgg Ile Arg Thr Ile Gln Pro Thr Gly Pro Tyr Arg Leu Leu Gly Trp 2190 2195 2200	7109
tcc ctc gga ggc aat gtt gtt cat gcg atc gca act cag ctg cag Ser Leu Gly Gly Asn Val Val His Ala Ile Ala Thr Gln Leu Gln 2205 2210 2215	7154
gaa caa ggg gaa gac ata tcg ctt ctt gtc atg ctt gat gct tac Glu Gln Gly Glu Asp Ile Ser Leu Leu Val Met Leu Asp Ala Tyr 2220 2225 2230	7199
ccg aat cac ttc ctt cca att aaa gat gcg cct gat gag cag gaa Pro Asn His Phe Leu Pro Ile Lys Asp Ala Pro Asp Glu Gln Glu 2235 2240 2245	7244
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ctt gac ggg gca ccg ctg aac ctt tcc agt gcg atc gat att ctg Leu Asp Gly Ala Pro Leu Asn Leu Ser Ser Ala Ile Asp Ile Leu 2265 2270 2275	7334
cgc cgc gac ggc agt gcg ctt gcc agc ctg gac gag gct gcg atc	7379

Arg	Arg	Asp	Gly	Ser	Ala	Leu	Ala	Ser	Leu	Asp	Glu	Ala	Ala	Ile	
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Leu	Asn	Leu	Lys	Glu	Thr	Tyr	Val	Asn	Ser	Val	Arg	Ile	Leu	Ser	
2295						2300					2305				
gaa	tat	aag	ccc	cgc	gtc	ttt	cat	ggc	gat	att	ctg	ttt	ttc	aaa	7469
Glu	Tyr	Lys	Pro	Arg	Val	Phe	His	Gly	Asp	Ile	Leu	Phe	Phe	Lys	
2310						2315					2320				
tca	acc	gtg	ata	ccg	gaa	tgg	ttt	gat	ccg	atc	gat	ccg	gag	tca	7514
Ser	Thr	Val	Ile	Pro	Glu	Trp	Phe	Asp	Pro	Ile	Asp	Pro	Glu	Ser	
2325						2330					2335				
tgg	cta	cct	tat	ttg	aac	gga	aac	att	gat	att	cat	gat	atg	gat	7559
Trp	Leu	Pro	Tyr	Leu	Asn	Gly	Asn	Ile	Asp	Ile	His	Asp	Met	Asp	
2340						2345					2350				
tgc	cgg	cat	aaa	gat	ttg	tgc	cag	ccg	gag	ccg	ctg	gcc	gaa	atc	7604
Cys	Arg	His	Lys	Asp	Leu	Cys	Gln	Pro	Glu	Pro	Leu	Ala	Glu	Ile	
2355						2360					2365				
gga	cgt	cgg	gtt	tcg	gaa	aag	ctg	gac	gac	ttg	aaa	aaa	gat	acg	7649
Gly	Arg	Arg	Val	Ser	Glu	Lys	Leu	Asp	Asp	Leu	Lys	Lys	Asp	Thr	
2370						2375					2380				
gat	aag	tagggagaga	tagcgatgac	aaatcctttt	gaaaatgaac	acggcacata									7705
Asp	Lys														
2385															
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<212>	PRT														
<213>	Bacillus licheniformis														
<400>	8														
Met	Pro	Glu	Cys	Gln	His	Asn	Arg	Lys	Pro	Leu	Ser	Gly	Ala	Gln	Ala
1				5				10					15		



Gly Ile Trp Phe Ala Gln Gln Leu Asp Pro Glu Asn Pro Ile Tyr Asn  
 20 25 30

Thr Ala Glu Tyr Val Glu Ile Lys Gly Pro Leu Asp Gln Glu Leu Phe  
 35 40 45

Glu Lys Ala Leu Arg His Val Ile Lys Glu Ala Glu Ser Phe His Ala  
 50 55 60

Arg Phe Gly Glu Asp Gln Asp Gly Pro Trp Gln Glu Ile Val Pro Ser  
 65 70 75 80

Thr Asp Phe Pro Leu His Tyr Ile Asp Val Ser Ser Glu Thr Asp Pro  
 85 90 95

Glu Gln Ala Ala Lys Ser Trp Met Met Asp Asp Leu Ala Arg Pro Val  
 100 105 110

Asp Leu Thr Arg Gly Pro Leu Phe Thr Glu Ala Leu Phe Lys Ala Ala  
 115 120 125

Gln Asp His Tyr Phe Trp Tyr Gln Arg Thr His His Ile Ala Thr Asp  
 130 135 140

Gly Phe Ser Phe Thr Leu Ile Ala Glu Arg Leu Ser Lys Ile Tyr Thr  
 145 150 155 160

Ala Leu Met Gln Asn Lys Ser Ile Asp Gln Ser Gly Ala Phe Gly Ser  
 165 170 175

Leu Asp Leu Ile Leu Ala Glu Glu Thr Ala Tyr Arg Ala Ser Glu Gln  
 180 185 190

Tyr Gln Glu Asp Arg Arg Phe Trp Leu Gly Arg Phe Ser Asp Glu Pro  
 195 200 205

Glu Val Val Ser Leu Ala Glu Arg Ala Pro Arg Thr Ser Ser Ser Phe  
 210 215 220

Leu Arg Arg Ser Glu His Leu Pro Ser Glu Asp Ala Asp Arg Leu Leu  
 225 230 235 240

Ser Ala Ala Ser Arg Met Gly Ala Thr Trp His Glu Thr Val Met Ala  
245 250 255

Ala Ala Ala Ile Tyr Val His Arg Leu Thr Gly Ala Asn Asp Val Val  
260 265 270

Leu Gly Met Pro Met Met Cys Arg Leu Gly Ser Ala Ala Leu His Ile  
275 280 285

Pro Gly Met Val Met Asn Leu Leu Pro Leu Arg Ile Gly Met Gln Pro  
290 295 300

Gln Met Ser Ile Gly Glu Leu Val Lys Gln Ile Ser Gly Glu Met Met  
305 310 315 320

Lys Leu Arg Arg His Gln His Tyr Arg His Glu Glu Leu Arg Arg Asp  
325 330 335

Leu Lys Leu Leu Gly Glu Asn Gln Arg Leu Phe Gly Pro Gln Leu Asn  
340 345 350

Leu Met Pro Phe Glu Asn Arg Leu Asn Phe Ala Gly Cys Gln Gly Ile  
355 360 365

Val His Asn Leu Ala Thr Gly Pro Val Asp Asp Leu Ser Ile Asn Ile  
370 375 380

Tyr Gly Arg Pro Asp Gly Gly Gly Leu Lys Val Asn Met Asp Ala Asn  
385 390 395 400

Pro Ala Val Tyr His Ala Asp Glu Leu Glu Asp His Gly Asn Arg Phe  
405 410 415

Leu Thr Leu Leu Lys Thr Ile Ala Val Cys Glu Gln Thr Gln Pro Val  
420 425 430

Gly Thr Leu Asp Ile Leu Leu Pro Glu Glu Arg Ala Gln Ile Leu Ile  
435 440 445

Glu Trp Asn Gln Thr Glu His Gly Leu Pro Lys Glu Ser Leu Pro Gln  
450 455 460

Arg Phe Glu Arg Met Ala Lys Glu Cys Pro Glu Ser Pro Ala Val Val  
 465 470 475 480

Cys Asn Asp Lys Val Leu Thr Tyr Ser Glu Leu Asn Gln Lys Ala Asn  
 485 490 495

Gln Leu Ala His Leu Leu Ile Asp Gln Gly Ala Lys Pro Glu Thr Phe  
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Ile Ala Leu Ala Leu Pro Arg Ser Ala Glu Met Val Val Ser Met Leu  
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Ala Val Leu Lys Ala Gly Ala Ala Tyr Leu Pro Ile Asp Pro Asp Tyr  
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Pro Ala Asp Arg Ile Glu Tyr Met Leu Asn Asp Ala Gln Pro Leu Leu  
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Val Met Thr Ser Lys Glu Ala Gln Asp Thr Ile Gly Ser Gln Met Pro  
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Lys Leu Ile Leu Asp Glu Gln Thr Val Met Glu Lys Met Ser Gly Cys  
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Ser Glu Glu Asn Pro Gly Glu Gln His Ser Gly Asn Gln Pro Ala Tyr  
 595 600 605

Met Ile Tyr Thr Ser Gly Ser Thr Gly Arg Pro Lys Gly Val Val Val  
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Gln Ala Glu Ser Leu Phe Asn Phe Leu Leu Ser Met Gln Asp Met Phe  
 625 630 635 640

Ala Leu Asn Gln Asp Asp Arg Leu Leu Ala Val Thr Thr Ile Ala Phe  
 645 650 655

Asp Ile Ser Ala Leu Glu Ile Tyr Leu Pro Leu Ile Ser Gly Ser Ala  
 660 665 670

Val Val Leu Ala Glu Lys Glu Thr Val Gln Asp Pro Ser Glu Leu Ala  
 675 680 685

Lys Met Ile Glu Thr Tyr Glu Ile Thr Ile Met Gln Ala Thr Pro Thr

690

695

700

Leu Trp His Ala Leu Ala Ser Ser Ala Pro Glu Lys Leu Lys Gly Leu  
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Arg Ala Leu Val Gly Gly Glu Ala Leu Gln Ser Ser Leu Ala Arg Gln  
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Leu Gln Gln Leu Ala Cys Ser Leu Thr Asn Leu Tyr Gly Pro Thr Glu  
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Thr Thr Ile Trp Ser Thr Ala Ala Ala Leu Glu Gly Asn Cys Thr Glu  
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Pro Pro Gly Ile Gly Cys Ala Ile Trp Asn Thr Gln Leu Tyr Val Leu  
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Asp Ala Gly Leu Gln Pro Val Pro Pro Gly Thr Ala Gly Glu Leu Tyr  
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Val Ala Gly Thr Gly Val Ala Arg Gly Tyr Leu Asn Arg His Ala Leu  
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Thr Ala Glu Arg Phe Ile Ala Asn Pro Tyr Gly Pro Pro Gly Ser Arg  
 820 825 830

Met Tyr Arg Thr Gly Asp Ile Val Arg Trp Arg Glu Asp Gly Ser Leu  
 835 840 845

Asp Tyr Ile Gly Arg Ala Asp His Gln Val Lys Ile Arg Gly Phe Arg  
 850 855 860

Ile Glu Met Gly Glu Ile Glu Ala Val Leu Ala Asn His Pro Val Val  
 865 870 875 880

Lys Gln Ala Ala Ala Ile Val Arg Glu Asp Gln Pro Gly Asp Pro Arg  
 885 890 895

Leu Phe Ala Tyr Ala Val Pro Ala Ser Gly Glu Ser Leu Asp Pro Ala  
 900 905 910

Glu Leu Arg Arg Phe Val Gly Glu Thr Leu Pro Asp Tyr Met Ile Pro  
 915 920 925

Ser Ala Phe Val Ile Leu Asp Glu Leu Pro Leu Thr Pro Asn Gly Lys  
 930 935 940

Leu Asp Arg Lys Ser Leu Pro Ala Pro Ala Val Ser Met His Thr Gly  
 945 950 955 960

Gly Arg Glu Pro Arg Thr Pro Gln Glu Glu Ile Leu Cys Asp Leu Phe  
 965 970 975

Ala Glu Val Leu Gly Val Pro Arg Val Ser Ile Asp Asp Ser Phe Phe  
 980 985 990

Asp Leu Gly Gly His Ser Leu Leu Ala Gly Arg Leu Val Gly Arg Ile  
 995 1000 1005

Arg Glu Met Leu Gly Val Glu Leu Gly Ile Gly Arg Leu Phe Asp  
 1010 1015 1020

Glu Pro Thr Ala Ala Gly Leu Ala Lys Gln Leu Asp Gln Ala Gln  
 1025 1030 1035

Ser Ala Arg Pro Ala Leu Arg Lys Arg Glu Arg Arg Lys Glu Ile  
 1040 1045 1050

Pro Leu Ser Phe Ala Gln Arg Arg Leu Trp Phe Leu His Cys Leu  
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Glu Gly Pro Ser Pro Thr Tyr Asn Ile Pro Val Val Val His Leu  
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Thr Gly Asp Leu Asp Gln Lys Ala Leu Ala Ala Ala Leu Gly Asp  
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Val Ala Thr Arg His Glu Pro Leu Arg Thr Ile Phe Pro Asp Gln  
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Gln Gly Thr Thr His Gln Leu Ile Leu Glu Glu Asp Gln Ser Arg  
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Pro Glu Leu Thr Val Ser His Val Ser Glu His Glu Leu Glu Lys  
 1130 1135 1140

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Pro	Pro	Phe	Arg	Ala	Gln	Leu	Phe	Val	Leu	Gly	Pro	Asp	Lys	Phe
1160						1165					1170			
Val	Leu	Leu	Leu	Leu	Leu	His	His	Met	Ile	Gly	Asp	Gly	Trp	Ser
1175						1180					1185			
Leu	Met	Pro	Leu	Thr	Arg	Asp	Leu	Glu	Thr	Ala	Tyr	Asn	Ala	Arg
1190						1195					1200			
Leu	Gln	Gly	Glu	Ala	Pro	Val	Trp	Glu	Pro	Leu	Ser	Ile	Gln	Tyr
1205						1210					1215			
Ala	Asp	Tyr	Ala	Val	Trp	Gln	Glu	Tyr	Leu	Leu	Gly	Ser	Glu	Asn
1220						1225					1230			
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1235						1240					1245			
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1250						1255					1260			
Pro	Arg	Pro	Ser	Glu	Ser	Ser	Tyr	Arg	Ser	Gly	Thr	Ile	Asp	Leu
1265						1270					1275			
Ser	Ile	Asp	Glu	Gln	Leu	His	Gly	Arg	Leu	Phe	Asp	Leu	Ser	Arg
1280						1285					1290			
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1295						1300					1305			
Ala	Leu	Leu	Thr	Arg	Leu	Gly	Ala	Gly	His	Asp	Ile	Pro	Leu	Gly
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Gln	Ile	Met	Leu	Ala	Phe	Gln	Asn	Thr	Pro	Glu	Pro	Glu	Leu	Asp
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Ala	Lys	Phe	Asp	Leu	Thr	Ile	Glu	Leu	Arg	Glu	His	Arg	Lys	Ala
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Asp	Gly	Thr	Pro	Ala	Gly	Ile	Gly	Gly	Phe	Leu	Glu	Tyr	Ser	Thr
1445						1450					1455			
Asp	Leu	Phe	Glu	Arg	Asn	Thr	Val	Gln	Thr	Leu	Ala	Glu	Arg	Leu
1460						1465					1470			
Val	Arg	Leu	Leu	Asp	Ser	Ala	Ala	Asp	Asp	Pro	Asp	Gln	Pro	Ile
1475						1480					1485			
Glu	Lys	Leu	Asp	Ile	Leu	Leu	Pro	Ala	Glu	Arg	Glu	Asn	Met	Leu
1490						1495					1500			
Ala	Asp	Trp	Ser	Lys	Ser	Ser	Asn	Ser	Ile	Pro	Cys	Ser	Ser	Leu
1505						1510					1515			
Pro	Val	Leu	Phe	Glu	Lys	Gln	Ala	Ala	Lys	Asp	Pro	Glu	Ala	Val
1520						1525					1530			
Ala	Val	Ile	Cys	Glu	Asn	Asn	Ala	Leu	Thr	Tyr	Gly	Glu	Leu	Asn
1535						1540					1545			
Lys	Arg	Ala	Asn	Arg	Leu	Ala	His	Leu	Leu	Ile	Ala	Lys	Gly	Val
1550						1555					1560			
Gly	Pro	Glu	Gln	Phe	Ala	Ala	Leu	Ala	Leu	Pro	Arg	Ser	Leu	Asp

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Met Val	Val Gly Leu Leu Ala	Val Leu Lys Ala Gly	Ala Ala Tyr	
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Val Pro	Leu Asp Pro Asp Tyr	Pro Ala Glu Arg Ile	Ala Phe Met	
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Leu Asn	Asp Ala His Pro Val	Cys Ile Val Thr Ser	Ser Ala Val	
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1640	1645	1650		
Asn Pro	Cys Asp Ala Asp Arg	Thr Ala Pro Leu Leu	Pro Leu His	
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Pro Ala	Tyr Val Ile Tyr Thr	Ser Gly Ser Thr Gly	Lys Pro Lys	
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Gly Val	Val Val Pro His Gln	Asn Val Val Arg Leu	Phe Gly Ala	
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Val Thr	Val Leu Asn Gln Thr	Pro Ser Ala Phe Tyr	Gln Leu Met	
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Gln Ala	Asp Arg Asp Asn Ala	Glu Thr Gly Lys Leu	Leu Ser Leu	
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Pro 2000	Glu	Tyr	Met	Val	Pro	Ser 2005	Ala	Phe	Val	Lys	Ile 2010	Ser	Glu	Leu
Pro 2015	Leu	Thr	Pro	Asn	Gly	Lys 2020	Leu	Asp	Arg	Lys	Ala 2025	Leu	Pro	Glu
Pro 2030	Asp	Phe	Ala	Ala	Ala	Val 2035	Lys	Gly	Arg	Gly	Pro 2040	Arg	Thr	Pro
Gln 2045	Glu	Glu	Ile	Leu	Cys	Asp 2050	Leu	Phe	Ser	Glu	Ile 2055	Leu	Asn	Ala
Pro 2060	Arg	Val	Gly	Ile	Asp	Asp 2065	Gly	Phe	Phe	Glu	Leu 2070	Gly	Gly	His
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Ser 2105	Gly	Leu	Ala	Glu	Arg	Leu 2110	Glu	Ser	Gly	Gly	Arg 2115	Gln	Ser	Ala
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Asp 2180	Asp	Met	Ala	Ala	Asp	Tyr 2185	Ile	Arg	His	Ile	Arg 2190	Thr	Ile	Gln
Pro 2195	Thr	Gly	Pro	Tyr	Arg	Leu 2200	Leu	Gly	Trp	Ser	Leu 2205	Gly	Gly	Asn

Val	Val	His	Ala	Ile	Ala	Thr	Gln	Leu	Gln	Glu	Gln	Gly	Glu	Asp
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2330						2335					2340			
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Ser Ile Asp Asp Ser Tyr Ser Ser Asn Leu Gly Leu Leu Asp Gln Ile  
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Ala Ala Leu Glu Trp Val Lys Asp Asn Ile Ala Phe Phe Gly Gly Asp  
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Arg His His Ile Thr Val Phe Gly Glu Ser Ala Gly Ser Met Ser Ile  
85 90 95

Ala Ser Leu Leu Ala Met Pro Lys Ala Lys Gly Leu Phe Gln Gln Ala  
100 105 110

Ile Met Glu Ser Gly Ala Ser Ala Thr Met Ser Asp Lys Leu Ala Lys  
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Asp Gln Leu Arg Thr Leu Met Gly Glu Asn Ile Phe Glu Leu Ile Phe  
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Leu Pro Ala Leu Asp Glu Lys Thr Leu Pro Leu Lys Pro Glu Val Ala  
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Thr Tyr Gly Glu Leu Trp Ser Gln Ser Glu Arg Leu Ala Ala Arg Ile	
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Gln Ser Glu Ala Leu Thr Asp Ala Ser Pro Ile Ile Val Tyr Gly His	
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His Pro Tyr Ile Pro Val Asp Val Ser Ile Pro Ala Asp Arg Ile Leu	
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aaa atc atc aac agt tca aaa gcc gag ctt ctg ctc aat aat tca ggc	821
Lys Ile Ile Asn Ser Ser Lys Ala Glu Leu Leu Leu Asn Asn Ser Gly	
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Thr Ser Val Asp Thr Gly Asp Ala Leu Ile Ser Val Val Glu Pro Gly	
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Val Leu Glu Gly Asp Gly Val Pro Glu Thr Asp Pro Gly Arg Trp Val	
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Gly	Glu	Thr	Leu	Pro	Ala	Ser	Val	Ala	Arg	Gln	Leu	Lys	Glu	Arg	Phe		
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Pro	Lys	Ala	Arg	Val	Phe	Asn	Thr	Tyr	Gly	Pro	Thr	Glu	Ala	Thr	Val		
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Glu Ser Gly Gly Ala Asp Gly Val Leu Lys Trp Gly Gln Ala Glu Ala	
95 100 105	
cgc cgg ccc ctg cct ttg tat gac agt ccg ctg ttt aaa ttt gcc gtt	869
Arg Arg Pro Leu Pro Leu Tyr Asp Ser Pro Leu Phe Lys Phe Ala Val	
110 115 120	
gtt cgc att agt gaa gaa gaa agc tgg ttt ttt gca aaa gtt cat cat	917
Val Arg Ile Ser Glu Glu Glu Ser Trp Phe Phe Ala Lys Val His His	
125 130 135	
atc att tcc gac ggc att tct atg acg atc cta ggc aac cgg att aca	965
Ile Ile Ser Asp Gly Ile Ser Met Thr Ile Leu Gly Asn Arg Ile Thr	
140 145 150 155	

gat att tat ttg aag ctt gcc aaa ggg gaa acc gac ctt gaa cct gta	1013
Asp Ile Tyr Leu Lys Leu Ala Lys Gly Glu Thr Asp Leu Glu Pro Val	
160 165 170	
cag tca tca ttt acg gaa cat atc cag agc gaa ttg gag tat gaa aat	1061
Gln Ser Ser Phe Thr Glu His Ile Gln Ser Glu Leu Glu Tyr Glu Asn	
175 180 185	
tcg aag cgt ttc cag aag gat aaa gca tat tgg aac gca caa tat gaa	1109
Ser Lys Arg Phe Gln Lys Asp Lys Ala Tyr Trp Asn Ala Gln Tyr Glu	
190 195 200	
gcg att ccg gag ccc gta tcg tta aaa gcg agc gat acg tat cag atc	1157
Ala Ile Pro Glu Pro Val Ser Leu Lys Ala Ser Asp Thr Tyr Gln Ile	
205 210 215	
caa ttg gat gca gcc cgc ttt tca aaa gag att tcc cct gac ctg tat	1205
Gln Leu Asp Ala Ala Arg Phe Ser Lys Glu Ile Ser Pro Asp Leu Tyr	
220 225 230 235	
aaa aaa att caa acg tat tgt aat gaa cac aac atc agt gta ctc tcc	1253
Lys Lys Ile Gln Thr Tyr Cys Asn Glu His Asn Ile Ser Val Leu Ser	
240 245 250	
ctg ttc cta tcc att ctg cac atc tat atg cac cgg gta acc gga caa	1301
Leu Phe Leu Ser Ile Leu His Ile Tyr Met His Arg Val Thr Gly Gln	
255 260 265	
aaa gac gtc gtt ctc gga aca ttt atg ggt aac cgg aca aat gca aaa	1349
Lys Asp Val Val Leu Gly Thr Phe Met Gly Asn Arg Thr Asn Ala Lys	
270 275 280	
gaa aaa cag atg ctc ggg atg ttt gtg tcg acg att ccg atg aaa gcc	1397
Glu Lys Gln Met Leu Gly Met Phe Val Ser Thr Ile Pro Met Lys Ala	
285 290 295	
tcc att gaa gta cac caa gac ttt agt gca ttt gtg cag gaa aga atg	1445
Ser Ile Glu Val His Gln Asp Phe Ser Ala Phe Val Gln Glu Arg Met	
300 305 310 315	
aag gac cag ctg aaa atc att cgg cat caa aag tat ccg tac aat ctg	1493
Lys Asp Gln Leu Lys Ile Ile Arg His Gln Lys Tyr Pro Tyr Asn Leu	
320 325 330	
ctg att aat gat ttg cgg gaa aga cag ccg cat gtc agc aaa ttg ttc	1541
Leu Ile Asn Asp Leu Arg Glu Arg Gln Pro His Val Ser Lys Leu Phe	
335 340 345	
gcc gtc tca ctg gaa tat cag gtt atg caa tgg cag caa aaa gaa acg	1589
Ala Val Ser Leu Glu Tyr Gln Val Met Gln Trp Gln Gln Lys Glu Thr	
350 355 360	
gtg tcg ttt ctt acc gag ccg att ttc agc ggc agt gaa gta aac gat	1637
Val Ser Phe Leu Thr Glu Pro Ile Phe Ser Gly Ser Glu Val Asn Asp	
365 370 375	

att tcc att cat gtg aaa gag aga tgg gat acc ggg acg ctt gcg att Ile Ser Ile His Val Lys Glu Arg Trp Asp Thr Gly Thr Leu Ala Ile 380 385 390 395	1685
gat ttt gat tac agg gag gag ctt ttt act tcg gaa gaa atg gcc gtg Asp Phe Asp Tyr Arg Glu Glu Leu Phe Thr Ser Glu Glu Met Ala Val 400 405 410	1733
tta tat gaa cgg ctg atg acg ctg ctt gaa gat gcc ctg ctg tct ccg Leu Tyr Glu Arg Leu Met Thr Leu Leu Glu Asp Ala Leu Leu Ser Pro 415 420 425	1781
caa aaa aca atc gct gaa ctg gag att gtt ccc gct ttt gaa aaa gag Gln Lys Thr Ile Ala Glu Leu Glu Ile Val Pro Ala Phe Glu Lys Glu 430 435 440	1829
cgg ctg tta aag cgt gca tca agc caa acc att gca tat gac aag aac Arg Leu Leu Lys Arg Ala Ser Ser Gln Thr Ile Ala Tyr Asp Lys Asn 445 450 455	1877
atg acc ctg cac ggt tta ttt gaa caa aaa gca gcc gat cat ccc gaa Met Thr Leu His Gly Leu Phe Glu Gln Lys Ala Ala Asp His Pro Glu 460 465 470 475	1925
aaa aca gcg gtt gta tat gaa gga caa aaa ctt tcg tac cgg gag ttg Lys Thr Ala Val Val Tyr Glu Gly Gln Lys Leu Ser Tyr Arg Glu Leu 480 485 490	1973
aat gaa caa tcg agc cgc ttg gca atg gcg ctt cgg aga aga ggc atc Asn Glu Gln Ser Ser Arg Leu Ala Met Ala Leu Arg Arg Arg Gly Ile 495 500 505	2021
ggg cct gat gct ccg gct gcg ata gtg atg gag cgg tca gag cgg gtc Gly Pro Asp Ala Pro Ala Ala Ile Val Met Glu Arg Ser Glu Arg Val 510 515 520	2069
atc acg gcg atg atg ggc gtt ttg aaa gcc ggc gga gct tat gta ccg Ile Thr Ala Met Met Gly Val Leu Lys Ala Gly Gly Ala Tyr Val Pro 525 530 535	2117
atc gat cct gga ttt ccg gaa gaa aga atc cgt ttt atg ctg gag gat Ile Asp Pro Gly Phe Pro Glu Glu Arg Ile Arg Phe Met Leu Glu Asp 540 545 550 555	2165
tca aag gcg aaa gcg gtt atc aca gac agc ggg ctg act ttt gaa acg Ser Lys Ala Lys Ala Val Ile Thr Asp Ser Gly Leu Thr Phe Glu Thr 560 565 570	2213
gct gaa acg gtg cag ttc agc gaa gcg ctt tct gaa tcg cgg gaa aac Ala Glu Thr Val Gln Phe Ser Glu Ala Leu Ser Glu Ser Arg Glu Asn 575 580 585	2261
ggc tat ccg tct tca gcg gca ggc gcc ggg cac ctt gca tac atc att Gly Tyr Pro Ser Ser Ala Ala Gly Ala Gly His Leu Ala Tyr Ile Ile 590 595 600	2309
tat act tcc ggt aca acg ggc cgt cca aaa ggc gtc atg att gaa cac	2357

Tyr	Thr	Ser	Gly	Thr	Thr	Gly	Arg	Pro	Lys	Gly	Val	Met	Ile	Glu	His		
605						610					615						
agg	cag	gtc	cac	cac	ctt	gtc	aga	gga	ctt	caa	cag	gcc	gtt	ggc	aca	2405	
Arg	Gln	Val	His	His	Leu	Val	Arg	Gly	Leu	Gln	Gln	Ala	Val	Gly	Thr		
620					625					630					635		
tac	gat	cag	gat	gat	ttg	aaa	ctg	gcg	ctt	ctg	gct	cca	ttt	cat	ttt	2453	
Tyr	Asp	Gln	Asp	Asp	Leu	Lys	Leu	Ala	Leu	Leu	Ala	Pro	Phe	His	Phe		
				640					645					650			
gat	gct	tcc	gtt	cag	cag	att	ttt	acg	tct	cta	ttg	ctc	ggg	caa	acg	2501	
Asp	Ala	Ser	Val	Gln	Gln	Ile	Phe	Thr	Ser	Leu	Leu	Leu	Gly	Gln	Thr		
			655					660					665				
ttg	tac	atc	gta	ccg	aaa	aag	acg	gtt	tcc	gac	gga	cgc	gct	tta	tcg	2549	
Leu	Tyr	Ile	Val	Pro	Lys	Lys	Thr	Val	Ser	Asp	Gly	Arg	Ala	Leu	Ser		
		670					675					680					
gat	tat	tac	cgc	cgg	cat	caa	atc	gat	gtg	aca	gac	ggc	aca	ccg	gca	2597	
Asp	Tyr	Tyr	Arg	Arg	His	Gln	Ile	Asp	Val	Thr	Asp	Gly	Thr	Pro	Ala		
	685					690					695						
cat	ttg	cag	ctt	ttg	gct	gcg	gct	gat	gat	ctt	tca	ggc	gtc	aaa	ttg	2645	
His	Leu	Gln	Leu	Leu	Ala	Ala	Ala	Asp	Asp	Leu	Ser	Gly	Val	Lys	Leu		
700					705					710					715		
agg	cat	atg	ctt	gtt	gga	gga	gag	gct	tta	tca	agg	gtt	gcg	acg	gaa	2693	
Arg	His	Met	Leu	Val	Gly	Gly	Glu	Ala	Leu	Ser	Arg	Val	Ala	Thr	Glu		
			720						725					730			
agg	ctg	ctt	cag	tta	ttt	gca	gaa	aca	gct	gaa	tcc	gtg	cct	gct	gtt	2741	
Arg	Leu	Leu	Gln	Leu	Phe	Ala	Glu	Thr	Ala	Glu	Ser	Val	Pro	Ala	Val		
			735					740					745				
acg	aat	gtt	tac	gga	ccg	acg	gaa	act	tgt	gtg	gat	gcc	tct	tct	ttt	2789	
Thr	Asn	Val	Tyr	Gly	Pro	Thr	Glu	Thr	Cys	Val	Asp	Ala	Ser	Ser	Phe		
		750					755					760					
acg	att	aca	aac	cgc	aca	gat	ctt	caa	tac	gat	acg	gcc	tat	gta	ccg	2837	
Thr	Ile	Thr	Asn	Arg	Thr	Asp	Leu	Gln	Tyr	Asp	Thr	Ala	Tyr	Val	Pro		
	765					770					775						
att	ggc	cgg	ccg	ata	gga	aat	aac	cgt	ttt	tat	att	ttg	gat	gaa	aac	2885	
Ile	Gly	Arg	Pro	Ile	Gly	Asn	Asn	Arg	Phe	Tyr	Ile	Leu	Asp	Glu	Asn		
780					785					790					795		
ggc	gca	ctc	ctt	cct	gat	ggc	gtc	gaa	ggg	gaa	ttg	tat	att	gca	gga	2933	
Gly	Ala	Leu	Leu	Pro	Asp	Gly	Val	Glu	Gly	Glu	Leu	Tyr	Ile	Ala	Gly		
				800					805					810			
gac	gga	gtc	ggg	cga	ggc	tat	ttg	aac	ttg	cct	gac	atg	acc	aga	gac	2981	
Asp	Gly	Val	Gly	Arg	Gly	Tyr	Leu	Asn	Leu	Pro	Asp	Met	Thr	Arg	Asp		
			815					820					825				
agg	ttc	ttg	aaa	gac	ccg	ttt	gta	tcc	gga	ggc	ctc	atg	tat	cga	aca	3029	
Arg	Phe	Leu	Lys	Asp	Pro	Phe	Val	Ser	Gly	Gly	Leu	Met	Tyr	Arg	Thr		

830	835	840	
ggg gat act gca cgt tgg ctt cct gac ggt aca gtt gat ttt atc ggc Gly Asp Thr Ala Arg Trp Leu Pro Asp Gly Thr Val Asp Phe Ile Gly 845	850	855	3077
cga aga gac gat caa gtg aaa atc cgc ggc ttc cgg atc gag ctt ggc Arg Arg Asp Asp Gln Val Lys Ile Arg Gly Phe Arg Ile Glu Leu Gly 860	865	870	3125
gag ata gag tcg gtg ctg caa gga gcc cct gct gtc gaa aaa gca gtt Glu Ile Glu Ser Val Leu Gln Gly Ala Pro Ala Val Glu Lys Ala Val 880	885	890	3173
gtc ctc gcg cgg cat gaa acc ggc ggc agc ctt gag gtt tgc gct tat Val Leu Ala Arg His Glu Thr Gly Gly Ser Leu Glu Val Cys Ala Tyr 895	900	905	3221
gtc gtt ccg aaa caa ggc gga aag att cac att cag gga ctg agg gag Val Val Pro Lys Gln Gly Gly Lys Ile His Ile Gln Gly Leu Arg Glu 910	915	920	3269
cac tta tcc aaa cac ctg cct gat tat atg atc cct tcc tgc ttt gtc His Leu Ser Lys His Leu Pro Asp Tyr Met Ile Pro Ser Cys Phe Val 925	930	935	3317
gag ctt aat gaa ata ccg ctg acg gca agc gga aaa gtc gac cgg aaa Glu Leu Asn Glu Ile Pro Leu Thr Ala Ser Gly Lys Val Asp Arg Lys 940	945	950	3365
gcg ctg ctt cgc cat gag gtg tct gtc agc ggg act gca gaa tat gcg Ala Leu Leu Arg His Glu Val Ser Val Ser Gly Thr Ala Glu Tyr Ala 960	965	970	3413
gcg ccg aga aat gaa tgt gaa gaa aaa atg gtg ggt ata tgg cag gaa Ala Pro Arg Asn Glu Cys Glu Glu Lys Met Val Gly Ile Trp Gln Glu 975	980	985	3461
gtg ctc gga gct gaa caa gtc gga atc cac gac cag ttt ttt gat ctg Val Leu Gly Ala Glu Gln Val Gly Ile His Asp Gln Phe Phe Asp Leu 990	995	1000	3509
ggc ggc cac tct ctc aaa gcg atg acc atg ctg gca aaa att cat Gly Gly His Ser Leu Lys Ala Met Thr Met Leu Ala Lys Ile His 1005	1010	1015	3554
aaa gct ttc gga gtc gaa gtt ccg ttg caa gtc cta ttt gaa aag Lys Ala Phe Gly Val Glu Val Pro Leu Gln Val Leu Phe Glu Lys 1020	1025	1030	3599
ccg aca gta gcg gcg ctg agc ggc ttt gtt tct gaa gcc gag aaa Pro Thr Val Ala Ala Leu Ser Gly Phe Val Ser Glu Ala Glu Lys 1035	1040	1045	3644
gac gga ttc gcg gta att gaa ccg gcg ccg gaa agt gac gat tat Asp Gly Phe Ala Val Ile Glu Pro Ala Pro Glu Ser Asp Asp Tyr 1050	1055	1060	3689



cct ctt tca ttg gcg cag cag	cga atc tat atc gtc agc cag ctg	3734
Pro Leu Ser Leu Ala Gln Gln	Arg Ile Tyr Ile Val Ser Gln Leu	
1065	1070 1075	
gag ggt gtc ggc tac aat atg	ccg gcc gcg gcg atg ctt gaa ggc	3779
Glu Gly Val Gly Tyr Asn Met	Pro Ala Ala Ala Met Leu Glu Gly	
1080	1085 1090	
act ctt gac tct ggg cgc ctt	gaa gct gct ttt caa aaa ctg att	3824
Thr Leu Asp Ser Gly Arg Leu	Glu Ala Ala Phe Gln Lys Leu Ile	
1095	1100 1105	
gat agg cat gag gcg ctg cgt	act tcg ttt aca gtt gtg gat ggc	3869
Asp Arg His Glu Ala Leu Arg	Thr Ser Phe Thr Val Val Asp Gly	
1110	1115 1120	
gag ccg agg cag acc gtt cat	caa agg gtt cag ttc aag att gag	3914
Glu Pro Arg Gln Thr Val His	Gln Arg Val Gln Phe Lys Ile Glu	
1125	1130 1135	
aag gtt aag gcg gaa ggc aag	ccg atc gaa caa atc gcg aaa tca	3959
Lys Val Lys Ala Glu Gly Lys	Pro Ile Glu Gln Ile Ala Lys Ser	
1140	1145 1150	
ttt gtc cgc cgc ttt gat ctc	gcc aaa gct ccg ctg atg aga gcg	4004
Phe Val Arg Arg Phe Asp Leu	Ala Lys Ala Pro Leu Met Arg Ala	
1155	1160 1165	
ggt ctc gtc agc ctt gca gac	ggc aga cat ctg ctg ttg ttc gat	4049
Gly Leu Val Ser Leu Ala Asp	Gly Arg His Leu Leu Leu Phe Asp	
1170	1175 1180	
atg cat cat ctc gta tct gac	ggc gtg tcg att tcg atc ata ttg	4094
Met His His Leu Val Ser Asp	Gly Val Ser Ile Ser Ile Ile Leu	
1185	1190 1195	
aat gaa ctg gcc gcg ctg tat	aac ggg gag gaa ttg ccg gag ctg	4139
Asn Glu Leu Ala Ala Leu Tyr	Asn Gly Glu Glu Leu Pro Glu Leu	
1200	1205 1210	
cgt ttg cat tac aaa gat tat	gcc ttc tgg caa agg gcg cag gca	4184
Arg Leu His Tyr Lys Asp Tyr	Ala Phe Trp Gln Arg Ala Gln Ala	
1215	1220 1225	
caa gaa ggc ttt caa aaa gaa	gag gcc tat tgg gaa agc atg ttt	4229
Gln Glu Gly Phe Gln Lys Glu	Glu Ala Tyr Trp Glu Ser Met Phe	
1230	1235 1240	
gcc ggc gag ctt ccc gta ctg	cag ctg atg acg gac gag ccg agg	4274
Ala Gly Glu Leu Pro Val Leu	Gln Leu Met Thr Asp Glu Pro Arg	
1245	1250 1255	
ccg cct gtt caa agc ttt gaa	gga gac agg gta tcc gca gtc ctg	4319
Pro Pro Val Gln Ser Phe Glu	Gly Asp Arg Val Ser Ala Val Leu	
1260	1265 1270	

cca aaa gac ctg aaa gaa aaa tta gcc gtg ctg gca gag caa aac	4364
Pro Lys Asp Leu Lys Glu Lys Leu Ala Val Leu Ala Glu Gln Asn	
1275 1280 1285	
ggc gcg aca ttg tac atg gtc atg ctg tct gcg tac aac atg ctt	4409
Gly Ala Thr Leu Tyr Met Val Met Leu Ser Ala Tyr Asn Met Leu	
1290 1295 1300	
ctt gca aag tac tcc ggg cag gaa gat gtg atc gtc ggg acg ccg	4454
Leu Ala Lys Tyr Ser Gly Gln Glu Asp Val Ile Val Gly Thr Pro	
1305 1310 1315	
gcg gcc ggc cgc aga cat tcc gat ctg gaa gga atc atc ggc atg	4499
Ala Ala Gly Arg Arg His Ser Asp Leu Glu Gly Ile Ile Gly Met	
1320 1325 1330	
ttt gtc aat acg ctg gcg atc cgt tca aaa gtg gac ccg ggc aga	4544
Phe Val Asn Thr Leu Ala Ile Arg Ser Lys Val Asp Pro Gly Arg	
1335 1340 1345	
acg ttc gca gac ttc ctg aat gat gta aag aaa acg gta atc gat	4589
Thr Phe Ala Asp Phe Leu Asn Asp Val Lys Lys Thr Val Ile Asp	
1350 1355 1360	
gct ttt gag cat cag gat tat ccg ttt gag cgg ctt gcg gag aag	4634
Ala Phe Glu His Gln Asp Tyr Pro Phe Glu Arg Leu Ala Glu Lys	
1365 1370 1375	
ttt ggc gca tcg cgc gat tta agc cgt cat ccc atc ttt gac acg	4679
Phe Gly Ala Ser Arg Asp Leu Ser Arg His Pro Ile Phe Asp Thr	
1380 1385 1390	
atg ttt att ttg cag aat gca tgg gaa gac att ccg ctg ctc ggc	4724
Met Phe Ile Leu Gln Asn Ala Trp Glu Asp Ile Pro Leu Leu Gly	
1395 1400 1405	
gat ttg cac ctc tcg att tat gaa acg aac ttc aat att gca aaa	4769
Asp Leu His Leu Ser Ile Tyr Glu Thr Asn Phe Asn Ile Ala Lys	
1410 1415 1420	
ttc gac ttg acg ctg cag gca aaa gaa gag cag gga gaa ttg ata	4814
Phe Asp Leu Thr Leu Gln Ala Lys Glu Glu Gln Gly Glu Leu Ile	
1425 1430 1435	
ctc gat ttg gat tac agc acg aag ctg ttt aaa aaa gat acg gct	4859
Leu Asp Leu Asp Tyr Ser Thr Lys Leu Phe Lys Lys Asp Thr Ala	
1440 1445 1450	
gaa agg atg ctg aaa gca tac ttg aac ctt ctg gag gac atg gcg	4904
Glu Arg Met Leu Lys Ala Tyr Leu Asn Leu Leu Glu Asp Met Ala	
1455 1460 1465	
gct gat ccg atg ctc agg atc ggc gag tac agc ctt ttg aca gaa	4949
Ala Asp Pro Met Leu Arg Ile Gly Glu Tyr Ser Leu Leu Thr Glu	
1470 1475 1480	
gaa gaa acg aat cgc cag ctc gtc gcg ttc aac ccc gcg aca agc	4994

Glu	Glu	Thr	Asn	Arg	Gln	Leu	Val	Ala	Phe	Asn	Pro	Ala	Thr	Ser	
1485						1490					1495				
gat	tat	ccg	cgg	gag	aaa	acg	atc	gtt	cag	cta	ttc	gag	gaa	cag	5039
Asp	Tyr	Pro	Arg	Glu	Lys	Thr	Ile	Val	Gln	Leu	Phe	Glu	Glu	Gln	
1500						1505					1510				
gct	gca	gaa	aga	ggc	ggc	tat	ccc	gcc	ctg	caa	ttt	gaa	gac	aaa	5084
Ala	Ala	Glu	Arg	Gly	Gly	Tyr	Pro	Ala	Leu	Gln	Phe	Glu	Asp	Lys	
1515						1520					1525				
gta	tgg	tca	tat	gat	gag	ctc	aat	cgg	aaa	gcg	aac	caa	ttg	gca	5129
Val	Trp	Ser	Tyr	Asp	Glu	Leu	Asn	Arg	Lys	Ala	Asn	Gln	Leu	Ala	
1530						1535					1540				
agg	cgc	ctc	cgc	gaa	agt	ggc	gtg	caa	gcc	ggc	acg	acg	gcg	gcc	5174
Arg	Arg	Leu	Arg	Glu	Ser	Gly	Val	Gln	Ala	Gly	Thr	Thr	Ala	Ala	
1545						1550					1555				
att	ctt	acg	gcc	agg	tcg	gct	gaa	atg	gtc	atc	ggc	att	ctc	gct	5219
Ile	Leu	Thr	Ala	Arg	Ser	Ala	Glu	Met	Val	Ile	Gly	Ile	Leu	Ala	
1560						1565					1570				
gtg	ctg	aaa	gcc	ggc	ggg	gct	tat	gtg	ccg	atc	gat	ccc	gat	cat	5264
Val	Leu	Lys	Ala	Gly	Gly	Ala	Tyr	Val	Pro	Ile	Asp	Pro	Asp	His	
1575						1580					1585				
ccg	gaa	aag	cgt	gtg	caa	cat	ttc	ttc	aag	gac	agc	gga	gcg	gcg	5309
Pro	Glu	Lys	Arg	Val	Gln	His	Phe	Phe	Lys	Asp	Ser	Gly	Ala	Ala	
1590						1595					1600				
gtt	ctt	tta	acg	caa	aag	gcg	atg	aag	ccg	ctc	gct	gag	gcg	gcg	5354
Val	Leu	Leu	Thr	Gln	Lys	Ala	Met	Lys	Pro	Leu	Ala	Glu	Ala	Ala	
1605						1610					1615				
gaa	ttt	ggc	ggc	gac	atc	cta	ttt	gtt	gag	gat	gaa	aac	ctt	tat	5399
Glu	Phe	Gly	Gly	Asp	Ile	Leu	Phe	Val	Glu	Asp	Glu	Asn	Leu	Tyr	
1620						1625					1630				
atg	gga	gat	gcg	tct	gat	ttg	cgc	ctt	ccg	att	tct	ccg	gaa	gca	5444
Met	Gly	Asp	Ala	Ser	Asp	Leu	Arg	Leu	Pro	Ile	Ser	Pro	Glu	Ala	
1635						1640					1645				
atg	gca	aat	cta	acg	tac	aca	tct	gga	acg	aca	ggg	acg	ccg	aag	5489
Met	Ala	Asn	Leu	Thr	Tyr	Thr	Ser	Gly	Thr	Thr	Gly	Thr	Pro	Lys	
1650						1655					1660				
ggc	aat	atg	gtc	tct	cac	cgg	aat	att	ttg	cgt	act	gta	aaa	aac	5534
Gly	Asn	Met	Val	Ser	His	Arg	Asn	Ile	Leu	Arg	Thr	Val	Lys	Asn	
1665						1670					1675				
gcg	aat	tac	ttg	gaa	gtg	atg	gaa	tcc	gat	atc	gtt	ctt	tcg	att	5579
Ala	Asn	Tyr	Leu	Glu	Val	Met	Glu	Ser	Asp	Ile	Val	Leu	Ser	Ile	
1680						1685					1690				
tca	aat	tat	gtg	ttc	gac	gcc	ttt	atg	ttt	gat	gtg	ttc	ggt	tca	5624
Ser	Asn	Tyr	Val	Phe	Asp	Ala	Phe	Met	Phe	Asp	Val	Phe	Gly	Ser	

1695	1700	1705	
ttg ctg aac ggc gcc aag ctg Leu Leu Asn Gly Ala Lys Leu 1710	ctg gtg ata gct cca aaa Leu Val Ile Ala Pro Lys 1715	gac acg att Asp Thr Ile 1720	5669
ctt gat atg agc cgg ctc gca Leu Asp Met Ser Arg Leu Ala 1725	cat gta ctc gaa aaa His Val Leu Glu Lys 1730	gaa aag att Glu Lys Ile 1735	5714
acg att tta atg atc acg acc Thr Ile Leu Met Ile Thr Thr 1740	gca tta ttc aat ctg Ala Leu Phe Asn Leu 1745	ctg aca gac Leu Thr Asp 1750	5759
atg cgg ccg gac agt ttg aag Met Arg Pro Asp Ser Leu Lys 1755	gga ctc cgc agg gtt Gly Leu Arg Arg Val 1760	ctg ttc ggc Leu Phe Gly 1765	5804
ggc gaa cgt gca tct gtc gat Gly Glu Arg Ala Ser Val Asp 1770	cat gtc aga aga gcc His Val Arg Arg Ala 1775	ctg aag aca Leu Lys Thr 1780	5849
gtt ggc aga ggg cgg ctg ctt Val Gly Arg Gly Arg Leu Leu 1785	cat atg tac ggt ccg His Met Tyr Gly Pro 1790	tct gag agc Ser Glu Ser 1795	5894
acg gtc ttt aca acc tac cat Thr Val Phe Thr Thr Tyr His 1800	cca gtc aat gaa gtg Pro Val Asn Glu Val 1805	ccg gac gat Pro Asp Asp 1810	5939
gcg cag gct ata ccg atc gga Ala Gln Ala Ile Pro Ile Gly 1815	aag cct gtc agc aat Lys Pro Val Ser Asn 1820	acg gag gtt Thr Glu Val 1825	5984
ctg att ctt gat tca ttc ggc Leu Ile Leu Asp Ser Phe Gly 1830	aat gta cag ccg gca Asn Val Gln Pro Ala 1835	ggg gtt gcg Gly Val Ala 1840	6029
gga gaa tta tgc gtc ggc gga Gly Glu Leu Cys Val Gly Gly 1845	gac ggc ctt gtc cgc Asp Gly Leu Val Arg 1850	ggc tat ttt Gly Tyr Phe 1855	6074
aac cgc cct gaa ctg acg gct Asn Arg Pro Glu Leu Thr Ala 1860	gaa aag ttt acg gcg Glu Lys Phe Thr Ala 1865	cat ccg ttc His Pro Phe 1870	6119
aaa acc ggc gaa aag att tac Lys Thr Gly Glu Lys Ile Tyr 1875	cgg acg ggt gat atg Arg Thr Gly Asp Met 1880	gcg aga tgg Ala Arg Trp 1885	6164
ctt gcc gac gga tgc ctc gaa Leu Ala Asp Gly Cys Leu Glu 1890	ttt atc ggt cgg att Phe Ile Gly Arg Ile 1895	gat cat cag Asp His Gln 1900	6209
gtc aaa att cgc gga cag aga Val Lys Ile Arg Gly Gln Arg 1905	atc gag ctg ggc gaa Ile Glu Leu Gly Glu 1910	atc gag cat Ile Glu His 1915	6254

cat ctc cta acg cat gac atg gtt cag gaa gcc gct gtt ctt gct His Leu Leu Thr His Asp Met Val Gln Glu Ala Ala Val Leu Ala 1920 1925 1930	6299
gtt gac acc ggg gcg gga gat caa atg atc tgt gca tac ttt acg Val Asp Thr Gly Ala Gly Asp Gln Met Ile Cys Ala Tyr Phe Thr 1935 1940 1945	6344
gct gat cag gag ctt tcg agc caa gag ctt cgc cga cat gcg gca Ala Asp Gln Glu Leu Ser Ser Gln Glu Leu Arg Arg His Ala Ala 1950 1955 1960	6389
gaa ggt ctg cca ggc tat atg atc ccg tct gtg ttt atg cag ctt Glu Gly Leu Pro Gly Tyr Met Ile Pro Ser Val Phe Met Gln Leu 1965 1970 1975	6434
gat gag ctt ccg ctc aca ggc aat gga aag atc gac aga agg gcg Asp Glu Leu Pro Leu Thr Gly Asn Gly Lys Ile Asp Arg Arg Ala 1980 1985 1990	6479
ctg cct gaa ccg gat atc gcg cag gcc gcg caa aag gaa tat acg Leu Pro Glu Pro Asp Ile Ala Gln Ala Ala Gln Lys Glu Tyr Thr 1995 2000 2005	6524
gcg cca agg agc ggc aca gaa gcg cag ctt gcc gat ctt tgg cag Ala Pro Arg Ser Gly Thr Glu Ala Gln Leu Ala Asp Leu Trp Gln 2010 2015 2020	6569
gag gtg ctc aat gta ccg aaa atc ggt gtg cat gac aat ttt ttt Glu Val Leu Asn Val Pro Lys Ile Gly Val His Asp Asn Phe Phe 2025 2030 2035	6614
gaa ctc ggc gga cac tct tta ctc gga atg acg ctc atc gcc gcg Glu Leu Gly Gly His Ser Leu Leu Gly Met Thr Leu Ile Ala Arg 2040 2045 2050	6659
atc cag caa gag atg aat gtt gac ctg cag ctg aaa gac ttg ttc Ile Gln Gln Glu Met Asn Val Asp Leu Gln Leu Lys Asp Leu Phe 2055 2060 2065	6704
cag gcg ccg aca atc gaa agc ctg gcc cag gcg gcg gca aaa tct Gln Ala Pro Thr Ile Glu Ser Leu Ala Gln Ala Ala Ala Lys Ser 2070 2075 2080	6749
gag aaa aaa tct gcc gtt tat att gaa gcg gcg ccg gac cgg gaa Glu Lys Lys Ser Ala Val Tyr Ile Glu Ala Ala Pro Asp Arg Glu 2085 2090 2095	6794
acg tac ccc gtt tcg tcg gcg caa aaa ccg ctg tac gtt ctt cag Thr Tyr Pro Val Ser Ser Ala Gln Lys Arg Leu Tyr Val Leu Gln 2100 2105 2110	6839
cag att gaa ggc gct gag aaa agc tat aac atg ccg gcc gtt ctc Gln Ile Glu Gly Ala Glu Lys Ser Tyr Asn Met Pro Ala Val Leu 2115 2120 2125	6884

caa ctt gaa gga aag ctt gac	ctg aag cgc ctg gag	tct gcc gcg	6929
Gln Leu Glu Gly Lys Leu Asp	Leu Lys Arg Leu Glu	Ser Ala Ala	
2130	2135	2140	
caa atg ctg atc aag cgc cat	gaa gcg ttc cgc acg	acg ttt gaa	6974
Gln Met Leu Ile Lys Arg His	Glu Ala Phe Arg Thr	Thr Phe Glu	
2145	2150	2155	
atc agg aac ggc gaa cct gtt	cag cgg att tgg gaa	gct gcg gaa	7019
Ile Arg Asn Gly Glu Pro Val	Gln Arg Ile Trp Glu	Ala Ala Glu	
2160	2165	2170	
ttg acc att gat gtc atc gat	gca gat gaa caa gaa	gcg gaa aag	7064
Leu Thr Ile Asp Val Ile Asp	Ala Asp Glu Gln Glu	Ala Glu Lys	
2175	2180	2185	
ctg att aaa gag ttc atc agg	ccg ttt gat tta aca	aag gct ccg	7109
Leu Ile Lys Glu Phe Ile Arg	Pro Phe Asp Leu Thr	Lys Ala Pro	
2190	2195	2200	
tta ttt aga atg agc atc ata	cgt gtc acg gaa gaa	aaa cat ctt	7154
Leu Phe Arg Met Ser Ile Ile	Arg Val Thr Glu Glu	Lys His Leu	
2205	2210	2215	
ttg ctt gtc gat atg cat cat	atc att tca gac ggc	gct tcc gtc	7199
Leu Leu Val Asp Met His His	Ile Ile Ser Asp Gly	Ala Ser Val	
2220	2225	2230	
agc gtg ctg atc gat gag atg	aca agg ctt tat gcg	gga gag gcg	7244
Ser Val Leu Ile Asp Glu Met	Thr Arg Leu Tyr Ala	Gly Glu Ala	
2235	2240	2245	
ctt gaa ccg ctg agg att cag	tat aaa gac tat gct	gta tgg cag	7289
Leu Glu Pro Leu Arg Ile Gln	Tyr Lys Asp Tyr Ala	Val Trp Gln	
2250	2255	2260	
cag cac ttg ctc act gaa cgg	cac aaa atg cag gag	gaa tac tgg	7334
Gln His Leu Leu Thr Glu Arg	His Lys Met Gln Glu	Glu Tyr Trp	
2265	2270	2275	
ctc aag gag ctt gac ggc gaa	ctg cct gtt ttg acg	ctc ccg aca	7379
Leu Lys Glu Leu Asp Gly Glu	Leu Pro Val Leu Thr	Leu Pro Thr	
2280	2285	2290	
gac tat ccg cgt cct tct gtt	caa acg ttt gaa gga	agc cgt atc	7424
Asp Tyr Pro Arg Pro Ser Val	Gln Thr Phe Glu Gly	Ser Arg Ile	
2295	2300	2305	
agc ttt tct ctg aaa ccg gag	ctt gtc cag cag ctc	aga aga ctg	7469
Ser Phe Ser Leu Lys Pro Glu	Leu Val Gln Gln Leu	Arg Arg Leu	
2310	2315	2320	
gcc aag gaa acg gaa agc act	tta tac atg gtg ctc	gct gcc tca	7514
Ala Lys Glu Thr Glu Ser Thr	Leu Tyr Met Val Leu	Ala Ala Ser	
2325	2330	2335	
tac agt acg ttt tta tcg aaa	ctg agt gga cag agc	gag gtc att	7559

Tyr	Ser	Thr	Phe	Leu	Ser	Lys	Leu	Ser	Gly	Gln	Ser	Glu	Val	Ile	
2340						2345					2350				
ttc	ggc	tct	ccg	gct	gcc	ggg	agg	ccg	cat	gca	gat	ttg	agc	cgt	7604
Phe	Gly	Ser	Pro	Ala	Ala	Gly	Arg	Pro	His	Ala	Asp	Leu	Ser	Arg	
2355						2360					2365				
atc	atc	ggc	atg	ttt	gtc	aat	acg	ctt	gcg	ata	aga	acg	cgt	cct	7649
Ile	Ile	Gly	Met	Phe	Val	Asn	Thr	Leu	Ala	Ile	Arg	Thr	Arg	Pro	
2370						2375					2380				
gaa	gga	gac	aag	ccg	ttt	tct	gca	ttc	ctt	gag	gaa	gta	aaa	gaa	7694
Glu	Gly	Asp	Lys	Pro	Phe	Ser	Ala	Phe	Leu	Glu	Glu	Val	Lys	Glu	
2385						2390					2395				
acg	acg	ctc	ggc	gca	ttt	gag	cat	caa	gat	tac	ccg	ttt	gaa	gaa	7739
Thr	Thr	Leu	Gly	Ala	Phe	Glu	His	Gln	Asp	Tyr	Pro	Phe	Glu	Glu	
2400						2405					2410				
ctg	atc	gag	aag	ctg	aac	atc	cag	cgc	gac	atg	agc	cga	aac	ccg	7784
Leu	Ile	Glu	Lys	Leu	Asn	Ile	Gln	Arg	Asp	Met	Ser	Arg	Asn	Pro	
2415						2420					2425				
tta	ttt	gat	gcc	gtc	ttt	tca	atg	caa	aat	gcc	gat	ttg	aaa	gac	7829
Leu	Phe	Asp	Ala	Val	Phe	Ser	Met	Gln	Asn	Ala	Asp	Leu	Lys	Asp	
2430						2435					2440				
ttg	tca	atg	gaa	gga	gtc	aca	ctt	aaa	ccg	tat	gat	ttt	gcc	cat	7874
Leu	Ser	Met	Glu	Gly	Val	Thr	Leu	Lys	Pro	Tyr	Asp	Phe	Ala	His	
2445						2450					2455				
cag	act	gcg	aaa	ttt	gat	ctg	acg	ttg	aca	gcg	gcg	gaa	gaa	gac	7919
Gln	Thr	Ala	Lys	Phe	Asp	Leu	Thr	Leu	Thr	Ala	Ala	Glu	Glu	Asp	
2460						2465					2470				
gga	ctt	ctc	gtt	ttt	gaa	atg	gaa	tac	aat	aca	gat	ctc	ttt	aag	7964
Gly	Leu	Leu	Val	Phe	Glu	Met	Glu	Tyr	Asn	Thr	Asp	Leu	Phe	Lys	
2475						2480					2485				
cgc	gaa	tcg	atc	aaa	cgc	tgg	agc	ggg	tac	tgg	gtc	aac	ctg	ctc	8009
Arg	Glu	Ser	Ile	Lys	Arg	Trp	Ser	Gly	Tyr	Trp	Val	Asn	Leu	Leu	
2490						2495					2500				
gaa	gcg	gtt	gcc	gaa	acc	ccg	gat	gca	agt	ctt	tca	gac	ctt	tcg	8054
Glu	Ala	Val	Ala	Glu	Thr	Pro	Asp	Ala	Ser	Leu	Ser	Asp	Leu	Ser	
2505						2510					2515				
ctt	ctg	gat	gaa	gcg	gaa	aaa	cgg	cgg	atc	gtc	caa	aag	tgg	aat	8099
Leu	Leu	Asp	Glu	Ala	Glu	Lys	Arg	Arg	Ile	Val	Gln	Lys	Trp	Asn	
2520						2525					2530				
gag	acg	aag	ctc	gct	gtg	ccg	cag	gac	aaa	acg	gtc	cat	gag	ctg	8144
Glu	Thr	Lys	Leu	Ala	Val	Pro	Gln	Asp	Lys	Thr	Val	His	Glu	Leu	
2535						2540					2545				
ttc	gaa	gcg	caa	gtc	ctc	cgc	act	cct	gac	cgc	ggg	gca	gcg	gtg	8189
Phe	Glu	Ala	Gln	Val	Leu	Arg	Thr	Pro	Asp	Arg	Gly	Ala	Ala	Val	

2550		2555		2560	
tac aac ggc gtg aag tgg acg	tac aaa gag ctg aac	gcg cgc gcc	8234		
Tyr Asn Gly Val Lys Trp Thr	Tyr Lys Glu Leu Asn	Ala Arg Ala			
2565	2570	2575			
aac cgt ctg gcc cgc ctg ctg	att gaa aaa gga gcc	ggg cct gag	8279		
Asn Arg Leu Ala Arg Leu Leu	Ile Glu Lys Gly Ala	Gly Pro Glu			
2580	2585	2590			
cag cgg gtc gga atc atg gtg	aag cct tgc ctg gaa	atg gcg gcc	8324		
Gln Arg Val Gly Ile Met Val	Lys Pro Ser Leu Glu	Met Ala Ala			
2595	2600	2605			
ggc gta ctt gcg att ttg aaa	gcg gga gcg gcc tat	gta ccg atc	8369		
Gly Val Leu Ala Ile Leu Lys	Ala Gly Ala Ala Tyr	Val Pro Ile			
2610	2615	2620			
gat ccc ggc tat ccg gcc gag	cgg atc gga tac gta	ctg aaa gac	8414		
Asp Pro Gly Tyr Pro Ala Glu	Arg Ile Gly Tyr Val	Leu Lys Asp			
2625	2630	2635			
agc ggt gca gaa ctg ctt ctg	acg caa aca aac tta	gcc gta cct	8459		
Ser Gly Ala Glu Leu Leu Leu	Thr Gln Thr Asn Leu	Ala Val Pro			
2640	2645	2650			
gaa gaa ttc agc ggt gaa acg	ctt ctt ctc gat tcg	atg ctg agc	8504		
Glu Glu Phe Ser Gly Glu Thr	Leu Leu Leu Asp Ser	Met Leu Ser			
2655	2660	2665			
gaa gaa atc aca aat gat gat	gaa gtg aac ccg cag	gca ggt aca	8549		
Glu Glu Ile Thr Asn Asp Asp	Glu Val Asn Pro Gln	Ala Gly Thr			
2670	2675	2680			
cag cca aac aac ctg gca tac	ttg att tac aca tcg	ggc acg aca	8594		
Gln Pro Asn Asn Leu Ala Tyr	Leu Ile Tyr Thr Ser	Gly Thr Thr			
2685	2690	2695			
ggc cag ccg aaa ggc gtc atg	gtc gaa cat caa tcg	ctc gtg aac	8639		
Gly Gln Pro Lys Gly Val Met	Val Glu His Gln Ser	Leu Val Asn			
2700	2705	2710			
ttg tgc tat tgg cat aac gat	gca ttc gcg gtc acc	gaa cag gac	8684		
Leu Cys Tyr Trp His Asn Asp	Ala Phe Ala Val Thr	Glu Gln Asp			
2715	2720	2725			
aaa agc gcg aaa tat gcc ggc	ttc ggc ttt gac gct	tcc gtc tgg	8729		
Lys Ser Ala Lys Tyr Ala Gly	Phe Gly Phe Asp Ala	Ser Val Trp			
2730	2735	2740			
gag atg ttc ccg tac tgg atc	gcc gga gcg gag ctt	cat atc att	8774		
Glu Met Phe Pro Tyr Trp Ile	Ala Gly Ala Glu Leu	His Ile Ile			
2745	2750	2755			
gat gaa gcg atc cgg atg gac	att acg cgt ttg aat	gaa tat ttc	8819		
Asp Glu Ala Ile Arg Met Asp	Ile Thr Arg Leu Asn	Glu Tyr Phe			
2760	2765	2770			



gaa gag aac gga ata acg atc acg ttc ctg ccg aca cag ctg tgc Glu Glu Asn Gly Ile Thr Ile Thr Phe Leu Pro Thr Gln Leu Cys 2775 2780 2785	8864
gaa cag ttc atg gag ctc gac aac cag tcg ctg cgc gtg ctg ctt Glu Gln Phe Met Glu Leu Asp Asn Gln Ser Leu Arg Val Leu Leu 2790 2795 2800	8909
acg ggc gga gac aag ctg aag cgg atc gaa aaa cgg aac tac acg Thr Gly Gly Asp Lys Leu Lys Arg Ile Glu Lys Arg Asn Tyr Thr 2805 2810 2815	8954
ctc gtc aac aac tat ggg ccg acg gaa aac aca gtc gtt gcg acg Leu Val Asn Asn Tyr Gly Pro Thr Glu Asn Thr Val Val Ala Thr 2820 2825 2830	8999
agc aca gca atc gat cct gat gaa ggc atg ctt tcg atc gga aag Ser Thr Ala Ile Asp Pro Asp Glu Gly Met Leu Ser Ile Gly Lys 2835 2840 2845	9044
ccg att gct aat acg cgg gcg tat gtg ctt gga caa aac aac gaa Pro Ile Ala Asn Thr Arg Ala Tyr Val Leu Gly Gln Asn Asn Glu 2850 2855 2860	9089
gtt cag cct gtc ggc gtc gct ggc gag ctg tgc atc gcc ggc cgc Val Gln Pro Val Gly Val Ala Gly Glu Leu Cys Ile Ala Gly Arg 2865 2870 2875	9134
ggg ctt gcg cgc ggc tat ctg aac aag ccg gag gaa acg gcg aag Gly Leu Ala Arg Gly Tyr Leu Asn Lys Pro Glu Glu Thr Ala Lys 2880 2885 2890	9179
cgt ttt acg gaa gac ccg ttt gtg ccg ggc gag cgc atg tac cgg Arg Phe Thr Glu Asp Pro Phe Val Pro Gly Glu Arg Met Tyr Arg 2895 2900 2905	9224
aca ggg gat gcg gtc aaa tgg ctg gaa gac ggg cgg ctt gag tac Thr Gly Asp Ala Val Lys Trp Leu Glu Asp Gly Arg Leu Glu Tyr 2910 2915 2920	9269
atc ggc cgg atc gac cag cag gtg aaa atc cgc ggc ttc cgg atc Ile Gly Arg Ile Asp Gln Gln Val Lys Ile Arg Gly Phe Arg Ile 2925 2930 2935	9314
gag ctt tct gaa att gaa gtc cag ctc gcg cgg ctc tct gaa gtt Glu Leu Ser Glu Ile Glu Val Gln Leu Ala Arg Leu Ser Glu Val 2940 2945 2950	9359
cag gaa gca gtc gtc acc gac atc gaa gac gcc tac ggc aac aaa Gln Glu Ala Val Val Thr Asp Ile Glu Asp Ala Tyr Gly Asn Lys 2955 2960 2965	9404
gcg ctg tgc ggc tat gtc gtt gcg gac gaa cag ctt gat aca gaa Ala Leu Cys Gly Tyr Val Val Ala Asp Glu Gln Leu Asp Thr Glu 2970 2975 2980	9449

agc ctc gcc cgt aag ctg ggg	cag acg ctt ccg gac	tac atg gta	9494
Ser Leu Ala Arg Lys Leu Gly	Gln Thr Leu Pro Asp	Tyr Met Val	
2985	2990	2995	
ccg gcg tat tgg gtg cag ctt	gat gag ctt ccg gtt	acg gcg aac	9539
Pro Ala Tyr Trp Val Gln Leu	Asp Glu Leu Pro Val	Thr Ala Asn	
3000	3005	3010	
gga aaa gtc gac cga agg gcg	ctg cct cag cct gac	gtc gaa gcg	9584
Gly Lys Val Asp Arg Arg Ala	Leu Pro Gln Pro Asp	Val Glu Ala	
3015	3020	3025	
cag aca gcc gaa tac aaa gcg	ccg cgc aca gaa acg	gaa cag ctg	9629
Gln Thr Ala Glu Tyr Lys Ala	Pro Arg Thr Glu Thr	Glu Gln Leu	
3030	3035	3040	
ttg gcg gac att tgg cag gat	gtt ctc ggc ata gac	cga atc gga	9674
Leu Ala Asp Ile Trp Gln Asp	Val Leu Gly Ile Asp	Arg Ile Gly	
3045	3050	3055	
gtc acg gac aat ttc ttc gcg	ctc ggc ggg gac tcg	atc aaa gga	9719
Val Thr Asp Asn Phe Phe Ala	Leu Gly Gly Asp Ser	Ile Lys Gly	
3060	3065	3070	
att caa atg gca agc cgc ctt	cag cag cac ggt tgg	aag ctg gag	9764
Ile Gln Met Ala Ser Arg Leu	Gln Gln His Gly Trp	Lys Leu Glu	
3075	3080	3085	
atg aag gac ttg ttt cag cac	ccg acg atc ggg gag	ctc agt gct	9809
Met Lys Asp Leu Phe Gln His	Pro Thr Ile Gly Glu	Leu Ser Ala	
3090	3095	3100	
tat gtt caa gcg gct gac gat	cag ccg atc gat cag	aac cct gtc	9854
Tyr Val Gln Ala Ala Asp Asp	Gln Pro Ile Asp Gln	Asn Pro Val	
3105	3110	3115	
gaa ggc gaa gtc aca ctg acg	ccg atc cag cgc tgg	ttc ttt gag	9899
Glu Gly Glu Val Thr Leu Thr	Pro Ile Gln Arg Trp	Phe Phe Glu	
3120	3125	3130	
cgc aaa ttt acg aac gag cat	cat tgg aac caa tca	gtt atg ctt	9944
Arg Lys Phe Thr Asn Glu His	His Trp Asn Gln Ser	Val Met Leu	
3135	3140	3145	
cac gcc cct tca ggg ttt gac	ccg gaa gcg gca ggc	aag gct tta	9989
His Ala Pro Ser Gly Phe Asp	Pro Glu Ala Ala Gly	Lys Ala Leu	
3150	3155	3160	
acc aag atg atc gaa cac cat	gat gca ctt cgc atg	gtt tat cag	10034
Thr Lys Met Ile Glu His His	Asp Ala Leu Arg Met	Val Tyr Gln	
3165	3170	3175	
cga aat gga gac ggg att gtt	cag tac aac aga ggg	ctg gaa gaa	10079
Arg Asn Gly Asp Gly Ile Val	Gln Tyr Asn Arg Gly	Leu Glu Glu	
3180	3185	3190	
aca gcg gtt cgt cct gaa gtc	atc cgc ttc aat gaa	tcg ggt gct	10124

Thr	Ala	Val	Arg	Pro	Glu	Val	Ile	Arg	Phe	Asn	Glu	Ser	Gly	Ala	
3195						3200					3205				
gaa	ctt	gaa	gct	gcc	gtg	tta	aag	gaa	tca	aac	cgg	att	caa	agc	10169
Glu	Leu	Glu	Ala	Ala	Val	Leu	Lys	Glu	Ser	Asn	Arg	Ile	Gln	Ser	
3210						3215					3220				
agt	atc	aat	tta	acc	gaa	ggc	ccg	ctt	ttg	aaa	gcg	gcg	atc	ttt	10214
Ser	Ile	Asn	Leu	Thr	Glu	Gly	Pro	Leu	Leu	Lys	Ala	Ala	Ile	Phe	
3225						3230					3235				
gag	acg	gat	caa	ggc	gat	cat	ctt	ctc	atc	gtc	att	cat	cat	ctc	10259
Glu	Thr	Asp	Gln	Gly	Asp	His	Leu	Leu	Ile	Val	Ile	His	His	Leu	
3240						3245					3250				
gtt	gtg	gac	gga	att	tca	tgg	aga	atc	ctc	ctt	gag	gat	ttc	gcc	10304
Val	Val	Asp	Gly	Ile	Ser	Trp	Arg	Ile	Leu	Leu	Glu	Asp	Phe	Ala	
3255						3260					3265				
gcc	ggg	tac	gcc	caa	gct	gaa	aaa	ggg	gag	ccg	atc	att	ctt	caa	10349
Ala	Gly	Tyr	Ala	Gln	Ala	Glu	Lys	Gly	Glu	Pro	Ile	Ile	Leu	Gln	
3270						3275					3280				
gaa	aag	acg	cac	tct	ttt	gct	gaa	tat	gcg	gct	cgc	ctg	aaa	gaa	10394
Glu	Lys	Thr	His	Ser	Phe	Ala	Glu	Tyr	Ala	Ala	Arg	Leu	Lys	Glu	
3285						3290					3295				
tac	gca	agg	tca	aaa	gct	ttc	gcg	aaa	gaa	atc	ggc	tat	tgg	cag	10439
Tyr	Ala	Arg	Ser	Lys	Ala	Phe	Ala	Lys	Glu	Ile	Gly	Tyr	Trp	Gln	
3300						3305					3310				
gaa	gtc	gag	aag	gcg	gag	acg	gca	tcg	ctc	cct	aaa	gat	gat	gaa	10484
Glu	Val	Glu	Lys	Ala	Glu	Thr	Ala	Ser	Leu	Pro	Lys	Asp	Asp	Glu	
3315						3320					3325				
gca	gag	gac	aaa	cgg	atg	cac	cat	acg	aaa	acg	gct	gag	ttt	tct	10529
Ala	Glu	Asp	Lys	Arg	Met	His	His	Thr	Lys	Thr	Ala	Glu	Phe	Ser	
3330						3335					3340				
ctc	tcg	aaa	gaa	gaa	aca	gaa	cag	ttg	atg	aca	aaa	gtt	cat	gaa	10574
Leu	Ser	Lys	Glu	Glu	Thr	Glu	Gln	Leu	Met	Thr	Lys	Val	His	Glu	
3345						3350					3355				
gca	tat	aac	acg	gaa	atg	aac	gac	att	ttg	ctt	acg	gcg	ttg	ggc	10619
Ala	Tyr	Asn	Thr	Glu	Met	Asn	Asp	Ile	Leu	Leu	Thr	Ala	Leu	Gly	
3360						3365					3370				
ttg	gcg	ctg	aaa	gag	tgg	acc	ggg	cag	gaa	gac	ttt	atc	atc	tgc	10664
Leu	Ala	Leu	Lys	Glu	Trp	Thr	Gly	Gln	Glu	Asp	Phe	Ile	Ile	Cys	
3375						3380					3385				
ttg	gag	gga	cac	ggc	cgg	gag	gac	atc	atg	gaa	ggc	ttg	aat	att	10709
Leu	Glu	Gly	His	Gly	Arg	Glu	Asp	Ile	Met	Glu	Gly	Leu	Asn	Ile	
3390						3395					3400				
tcc	cgg	acg	gtc	ggc	tgg	ttt	aca	agc	cag	ttc	ccg	gcg	ctg	att	10754
Ser	Arg	Thr	Val	Gly	Trp	Phe	Thr	Ser	Gln	Phe	Pro	Ala	Leu	Ile	

3405	3410	3415	
caa ctg cgc cat tcc gaa gat	atc ggc tat caa atc	aaa cag atc	10799
Gln Leu Arg His Ser Glu Asp	Ile Gly Tyr Gln Ile	Lys Gln Ile	
3420	3425	3430	
aaa gaa gag ttg cgc cac att	ccg aat aaa gga atc	ggc tat ggc	10844
Lys Glu Glu Leu Arg His Ile	Pro Asn Lys Gly Ile	Gly Tyr Gly	
3435	3440	3445	
att tat cgc tat ttg acc gaa	gaa ggc aaa aag gcg	cag ccg atc	10889
Ile Tyr Arg Tyr Leu Thr Glu	Glu Gly Lys Lys Ala	Gln Pro Ile	
3450	3455	3460	
aag cat gat atc agc ttt aac	tat ttg ggc cag ttt	gca gag atg	10934
Lys His Asp Ile Ser Phe Asn	Tyr Leu Gly Gln Phe	Ala Glu Met	
3465	3470	3475	
gcg gat tcg ggt ctg ttc acg	aga tca gct ttg ccg	tcc ggc gat	10979
Ala Asp Ser Gly Leu Phe Thr	Arg Ser Ala Leu Pro	Ser Gly Asp	
3480	3485	3490	
ccg ctc agc ccg gaa acg gaa	aaa ccg aat gcg cta	gac atc gtc	11024
Pro Leu Ser Pro Glu Thr Glu	Lys Pro Asn Ala Leu	Asp Ile Val	
3495	3500	3505	
ggc tat atc gaa aac ggc att	ttg aca atg tca att	gcc tat cat	11069
Gly Tyr Ile Glu Asn Gly Ile	Leu Thr Met Ser Ile	Ala Tyr His	
3510	3515	3520	
tca ctc gaa tac aaa gaa agc	acc gtc gcc gct gtc	gcc gca agc	11114
Ser Leu Glu Tyr Lys Glu Ser	Thr Val Ala Ala Val	Ala Ala Ser	
3525	3530	3535	
ttt aaa act tat ttg ctg caa	ttg atc gat cat tgc	tta gag ctg	11159
Phe Lys Thr Tyr Leu Leu Gln	Leu Ile Asp His Cys	Leu Glu Leu	
3540	3545	3550	
gat gga ggc gaa ctg acc ccg	agc gat ctt gga gat	gac gaa cta	11204
Asp Gly Gly Glu Leu Thr Pro	Ser Asp Leu Gly Asp	Asp Glu Leu	
3555	3560	3565	
acg ctt gaa gaa tta gat aaa	ctg atg gaa att ttc	taacaaaaaa	11250
Thr Leu Glu Glu Leu Asp Lys	Leu Met Glu Ile Phe		
3570	3575	3580	
acgaggtgcc ttatggggaa acaaaagatt	caaaaggtgt atcctttgac	accgatgcag	11310
gaaggaatgc tgtaccacgc aatgcttgat	ccggaatctt cctcttactt	cacacagctg	11370
gagcttgatca tagacgggga atttgatttg	gggatctttg aaaaaagcgt	gaatcagctc	11430
gtgcgttcac acgatattct cagaacgggt	tttgttcatc agcaattgca	aaaaccgcgc	11490
caggttgatcc tggctgaacg gcaggcaata	gtggaatttg aggatcttgc	ggacttggat	11550
gaggaaaggc aaaaaacccg cattgaccgg	tataaacaag aggtacaggc	ggccgggttt	11610

aatttggcga aagacatgct gtttaaaacg gcggtctttc ggcttgaccg gaaaaaatac 11670  
catctcgtct ggagcaacca tcatacgtg atggacggct ggagcatggg gatattgatg 11730  
aaacgccttt 11740

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<211> 3580  
<212> PRT  
<213> Bacillus licheniformis

<400> 14

Met Gly Asn Thr Phe Tyr Pro Leu Thr His Ala Gln Arg Arg Ile Trp  
1 5 10 15

Tyr Thr Glu Lys Phe Tyr Pro Gly Thr Ser Val Ser Asn Leu Ser Gly  
20 25 30

Phe Gly Lys Leu Lys Ser Ala Ser Gly Ile Asp Ser Gly Leu Leu Thr  
35 40 45

Glu Ala Ile Arg Lys Phe Val Arg Thr Asn Asp Thr Met Arg Phe Arg  
50 55 60

Leu Met Phe Glu Gly Glu Asp Glu Pro Lys Gln Tyr Ile Ala Glu Asp  
65 70 75 80

Glu Pro Phe Gln Ile Glu Tyr Phe Asp Ala Ser Glu Ser Gly Gly Ala  
85 90 95

Asp Gly Val Leu Lys Trp Gly Gln Ala Glu Ala Arg Arg Pro Leu Pro  
100 105 110

Leu Tyr Asp Ser Pro Leu Phe Lys Phe Ala Val Val Arg Ile Ser Glu  
115 120 125

Glu Glu Ser Trp Phe Phe Ala Lys Val His His Ile Ile Ser Asp Gly  
130 135 140

Ile Ser Met Thr Ile Leu Gly Asn Arg Ile Thr Asp Ile Tyr Leu Lys  
145 150 155 160

Leu Ala Lys Gly Glu Thr Asp Leu Glu Pro Val Gln Ser Ser Phe Thr  
165 170 175

Glu His Ile Gln Ser Glu Leu Glu Tyr Glu Asn Ser Lys Arg Phe Gln  
180 185 190

Lys Asp Lys Ala Tyr Trp Asn Ala Gln Tyr Glu Ala Ile Pro Glu Pro  
195 200 205

Val Ser Leu Lys Ala Ser Asp Thr Tyr Gln Ile Gln Leu Asp Ala Ala  
210 215 220

Arg Phe Ser Lys Glu Ile Ser Pro Asp Leu Tyr Lys Lys Ile Gln Thr  
225 230 235 240

Tyr Cys Asn Glu His Asn Ile Ser Val Leu Ser Leu Phe Leu Ser Ile  
245 250 255

Leu His Ile Tyr Met His Arg Val Thr Gly Gln Lys Asp Val Val Leu  
260 265 270

Gly Thr Phe Met Gly Asn Arg Thr Asn Ala Lys Glu Lys Gln Met Leu  
275 280 285

Gly Met Phe Val Ser Thr Ile Pro Met Lys Ala Ser Ile Glu Val His  
290 295 300

Gln Asp Phe Ser Ala Phe Val Gln Glu Arg Met Lys Asp Gln Leu Lys  
305 310 315 320

Ile Ile Arg His Gln Lys Tyr Pro Tyr Asn Leu Leu Ile Asn Asp Leu  
325 330 335

Arg Glu Arg Gln Pro His Val Ser Lys Leu Phe Ala Val Ser Leu Glu  
340 345 350

Tyr Gln Val Met Gln Trp Gln Gln Lys Glu Thr Val Ser Phe Leu Thr  
355 360 365

Glu Pro Ile Phe Ser Gly Ser Glu Val Asn Asp Ile Ser Ile His Val  
370 375 380

Lys Glu Arg Trp Asp Thr Gly Thr Leu Ala Ile Asp Phe Asp Tyr Arg  
385 390 395 400

Glu Glu Leu Phe Thr Ser Glu Glu Met Ala Val Leu Tyr Glu Arg Leu  
405 410 415

Met Thr Leu Leu Glu Asp Ala Leu Leu Ser Pro Gln Lys Thr Ile Ala  
420 425 430

Glu Leu Glu Ile Val Pro Ala Phe Glu Lys Glu Arg Leu Leu Lys Arg  
435 440 445

Ala Ser Ser Gln Thr Ile Ala Tyr Asp Lys Asn Met Thr Leu His Gly  
450 455 460

Leu Phe Glu Gln Lys Ala Ala Asp His Pro Glu Lys Thr Ala Val Val  
465 470 475 480

Tyr Glu Gly Gln Lys Leu Ser Tyr Arg Glu Leu Asn Glu Gln Ser Ser  
485 490 495

Arg Leu Ala Met Ala Leu Arg Arg Arg Gly Ile Gly Pro Asp Ala Pro  
500 505 510

Ala Ala Ile Val Met Glu Arg Ser Glu Arg Val Ile Thr Ala Met Met  
515 520 525

Gly Val Leu Lys Ala Gly Gly Ala Tyr Val Pro Ile Asp Pro Gly Phe  
530 535 540

Pro Glu Glu Arg Ile Arg Phe Met Leu Glu Asp Ser Lys Ala Lys Ala  
545 550 555 560

Val Ile Thr Asp Ser Gly Leu Thr Phe Glu Thr Ala Glu Thr Val Gln  
565 570 575

Phe Ser Glu Ala Leu Ser Glu Ser Arg Glu Asn Gly Tyr Pro Ser Ser  
580 585 590

Ala Ala Gly Ala Gly His Leu Ala Tyr Ile Ile Tyr Thr Ser Gly Thr  
595 600 605

Thr Gly Arg Pro Lys Gly Val Met Ile Glu His Arg Gln Val His His  
610 615 620

Leu Val Arg Gly Leu Gln Gln Ala Val Gly Thr Tyr Asp Gln Asp Asp  
625 630 635 640

Leu Lys Leu Ala Leu Leu Ala Pro Phe His Phe Asp Ala Ser Val Gln  
645 650 655

Gln Ile Phe Thr Ser Leu Leu Leu Gly Gln Thr Leu Tyr Ile Val Pro  
660 665 670

Lys Lys Thr Val Ser Asp Gly Arg Ala Leu Ser Asp Tyr Tyr Arg Arg  
675 680 685

His Gln Ile Asp Val Thr Asp Gly Thr Pro Ala His Leu Gln Leu Leu  
690 695 700

Ala Ala Ala Asp Asp Leu Ser Gly Val Lys Leu Arg His Met Leu Val  
705 710 715 720

Gly Gly Glu Ala Leu Ser Arg Val Ala Thr Glu Arg Leu Leu Gln Leu  
725 730 735

Phe Ala Glu Thr Ala Glu Ser Val Pro Ala Val Thr Asn Val Tyr Gly  
740 745 750

Pro Thr Glu Thr Cys Val Asp Ala Ser Ser Phe Thr Ile Thr Asn Arg  
755 760 765

Thr Asp Leu Gln Tyr Asp Thr Ala Tyr Val Pro Ile Gly Arg Pro Ile  
770 775 780

Gly Asn Asn Arg Phe Tyr Ile Leu Asp Glu Asn Gly Ala Leu Leu Pro  
785 790 795 800

Asp Gly Val Glu Gly Glu Leu Tyr Ile Ala Gly Asp Gly Val Gly Arg  
805 810 815

Gly Tyr Leu Asn Leu Pro Asp Met Thr Arg Asp Arg Phe Leu Lys Asp  
820 825 830

Pro Phe Val Ser Gly Gly Leu Met Tyr Arg Thr Gly Asp Thr Ala Arg  
835 840 845

Trp Leu Pro Asp Gly Thr Val Asp Phe Ile Gly Arg Arg Asp Asp Gln



850	855	860
Val Lys Ile Arg Gly Phe Arg Ile Glu Leu Gly Glu Ile Glu Ser Val		
865	870	875 880
Leu Gln Gly Ala Pro Ala Val Glu Lys Ala Val Val Leu Ala Arg His		
	885	890 895
Glu Thr Gly Gly Ser Leu Glu Val Cys Ala Tyr Val Val Pro Lys Gln		
	900	905 910
Gly Gly Lys Ile His Ile Gln Gly Leu Arg Glu His Leu Ser Lys His		
	915	920 925
Leu Pro Asp Tyr Met Ile Pro Ser Cys Phe Val Glu Leu Asn Glu Ile		
	930	935 940
Pro Leu Thr Ala Ser Gly Lys Val Asp Arg Lys Ala Leu Leu Arg His		
	945	950 955 960
Glu Val Ser Val Ser Gly Thr Ala Glu Tyr Ala Ala Pro Arg Asn Glu		
	965	970 975
Cys Glu Glu Lys Met Val Gly Ile Trp Gln Glu Val Leu Gly Ala Glu		
	980	985 990
Gln Val Gly Ile His Asp Gln Phe Phe Asp Leu Gly Gly His Ser Leu		
	995	1000 1005
Lys Ala Met Thr Met Leu Ala Lys Ile His Lys Ala Phe Gly Val		
	1010	1015 1020
Glu Val Pro Leu Gln Val Leu Phe Glu Lys Pro Thr Val Ala Ala		
	1025	1030 1035
Leu Ser Gly Phe Val Ser Glu Ala Glu Lys Asp Gly Phe Ala Val		
	1040	1045 1050
Ile Glu Pro Ala Pro Glu Ser Asp Asp Tyr Pro Leu Ser Leu Ala		
	1055	1060 1065
Gln Gln Arg Ile Tyr Ile Val Ser Gln Leu Glu Gly Val Gly Tyr		
	1070	1075 1080

Asn Met	Pro Ala Ala Ala Met	Leu Glu Gly Thr Leu	Asp Ser Gly
1085	1090	1095	
Arg Leu	Glu Ala Ala Phe Gln	Lys Leu Ile Asp Arg	His Glu Ala
1100	1105	1110	
Leu Arg	Thr Ser Phe Thr Val	Val Asp Gly Glu Pro	Arg Gln Thr
1115	1120	1125	
Val His	Gln Arg Val Gln Phe	Lys Ile Glu Lys Val	Lys Ala Glu
1130	1135	1140	
Gly Lys	Pro Ile Glu Gln Ile	Ala Lys Ser Phe Val	Arg Arg Phe
1145	1150	1155	
Asp Leu	Ala Lys Ala Pro Leu	Met Arg Ala Gly Leu	Val Ser Leu
1160	1165	1170	
Ala Asp	Gly Arg His Leu Leu	Leu Phe Asp Met His	His Leu Val
1175	1180	1185	
Ser Asp	Gly Val Ser Ile Ser	Ile Ile Leu Asn Glu	Leu Ala Ala
1190	1195	1200	
Leu Tyr	Asn Gly Glu Glu Leu	Pro Glu Leu Arg Leu	His Tyr Lys
1205	1210	1215	
Asp Tyr	Ala Phe Trp Gln Arg	Ala Gln Ala Gln Glu	Gly Phe Gln
1220	1225	1230	
Lys Glu	Glu Ala Tyr Trp Glu	Ser Met Phe Ala Gly	Glu Leu Pro
1235	1240	1245	
Val Leu	Gln Leu Met Thr Asp	Glu Pro Arg Pro Pro	Val Gln Ser
1250	1255	1260	
Phe Glu	Gly Asp Arg Val Ser	Ala Val Leu Pro Lys	Asp Leu Lys
1265	1270	1275	
Glu Lys	Leu Ala Val Leu Ala	Glu Gln Asn Gly Ala	Thr Leu Tyr
1280	1285	1290	

Met Val	Met Leu Ser Ala Tyr	Asn Met Leu Leu Ala	Lys Tyr Ser
1295	1300	1305	
Gly Gln	Glu Asp Val Ile Val	Gly Thr Pro Ala Ala	Gly Arg Arg
1310	1315	1320	
His Ser	Asp Leu Glu Gly Ile	Ile Gly Met Phe Val	Asn Thr Leu
1325	1330	1335	
Ala Ile	Arg Ser Lys Val Asp	Pro Gly Arg Thr Phe	Ala Asp Phe
1340	1345	1350	
Leu Asn	Asp Val Lys Lys Thr	Val Ile Asp Ala Phe	Glu His Gln
1355	1360	1365	
Asp Tyr	Pro Phe Glu Arg Leu	Ala Glu Lys Phe Gly	Ala Ser Arg
1370	1375	1380	
Asp Leu	Ser Arg His Pro Ile	Phe Asp Thr Met Phe	Ile Leu Gln
1385	1390	1395	
Asn Ala	Trp Glu Asp Ile Pro	Leu Leu Gly Asp Leu	His Leu Ser
1400	1405	1410	
Ile Tyr	Glu Thr Asn Phe Asn	Ile Ala Lys Phe Asp	Leu Thr Leu
1415	1420	1425	
Gln Ala	Lys Glu Glu Gln Gly	Glu Leu Ile Leu Asp	Leu Asp Tyr
1430	1435	1440	
Ser Thr	Lys Leu Phe Lys Lys	Asp Thr Ala Glu Arg	Met Leu Lys
1445	1450	1455	
Ala Tyr	Leu Asn Leu Leu Glu	Asp Met Ala Ala Asp	Pro Met Leu
1460	1465	1470	
Arg Ile	Gly Glu Tyr Ser Leu	Leu Thr Glu Glu Glu	Thr Asn Arg
1475	1480	1485	
Gln Leu	Val Ala Phe Asn Pro	Ala Thr Ser Asp Tyr	Pro Arg Glu
1490	1495	1500	

Lys	Thr	Ile	Val	Gln	Leu	Phe	Glu	Glu	Gln	Ala	Ala	Glu	Arg	Gly
1505						1510					1515			
Gly	Tyr	Pro	Ala	Leu	Gln	Phe	Glu	Asp	Lys	Val	Trp	Ser	Tyr	Asp
1520						1525					1530			
Glu	Leu	Asn	Arg	Lys	Ala	Asn	Gln	Leu	Ala	Arg	Arg	Leu	Arg	Glu
1535						1540					1545			
Ser	Gly	Val	Gln	Ala	Gly	Thr	Thr	Ala	Ala	Ile	Leu	Thr	Ala	Arg
1550						1555					1560			
Ser	Ala	Glu	Met	Val	Ile	Gly	Ile	Leu	Ala	Val	Leu	Lys	Ala	Gly
1565						1570					1575			
Gly	Ala	Tyr	Val	Pro	Ile	Asp	Pro	Asp	His	Pro	Glu	Lys	Arg	Val
1580						1585					1590			
Gln	His	Phe	Phe	Lys	Asp	Ser	Gly	Ala	Ala	Val	Leu	Leu	Thr	Gln
1595						1600					1605			
Lys	Ala	Met	Lys	Pro	Leu	Ala	Glu	Ala	Ala	Glu	Phe	Gly	Gly	Asp
1610						1615					1620			
Ile	Leu	Phe	Val	Glu	Asp	Glu	Asn	Leu	Tyr	Met	Gly	Asp	Ala	Ser
1625						1630					1635			
Asp	Leu	Arg	Leu	Pro	Ile	Ser	Pro	Glu	Ala	Met	Ala	Asn	Leu	Thr
1640						1645					1650			
Tyr	Thr	Ser	Gly	Thr	Thr	Gly	Thr	Pro	Lys	Gly	Asn	Met	Val	Ser
1655						1660					1665			
His	Arg	Asn	Ile	Leu	Arg	Thr	Val	Lys	Asn	Ala	Asn	Tyr	Leu	Glu
1670						1675					1680			
Val	Met	Glu	Ser	Asp	Ile	Val	Leu	Ser	Ile	Ser	Asn	Tyr	Val	Phe
1685						1690					1695			
Asp	Ala	Phe	Met	Phe	Asp	Val	Phe	Gly	Ser	Leu	Leu	Asn	Gly	Ala
1700						1705					1710			
Lys	Leu	Val	Ile	Ala	Pro	Lys	Asp	Thr	Ile	Leu	Asp	Met	Ser	Arg

1715		1720		1725
Leu Ala His Val Leu Glu Lys Glu Lys Ile Thr Ile Leu Met Ile				
1730		1735		1740
Thr Thr Ala Leu Phe Asn Leu Leu Thr Asp Met Arg Pro Asp Ser				
1745		1750		1755
Leu Lys Gly Leu Arg Arg Val Leu Phe Gly Gly Glu Arg Ala Ser				
1760		1765		1770
Val Asp His Val Arg Arg Ala Leu Lys Thr Val Gly Arg Gly Arg				
1775		1780		1785
Leu Leu His Met Tyr Gly Pro Ser Glu Ser Thr Val Phe Thr Thr				
1790		1795		1800
Tyr His Pro Val Asn Glu Val Pro Asp Asp Ala Gln Ala Ile Pro				
1805		1810		1815
Ile Gly Lys Pro Val Ser Asn Thr Glu Val Leu Ile Leu Asp Ser				
1820		1825		1830
Phe Gly Asn Val Gln Pro Ala Gly Val Ala Gly Glu Leu Cys Val				
1835		1840		1845
Gly Gly Asp Gly Leu Val Arg Gly Tyr Phe Asn Arg Pro Glu Leu				
1850		1855		1860
Thr Ala Glu Lys Phe Thr Ala His Pro Phe Lys Thr Gly Glu Lys				
1865		1870		1875
Ile Tyr Arg Thr Gly Asp Met Ala Arg Trp Leu Ala Asp Gly Cys				
1880		1885		1890
Leu Glu Phe Ile Gly Arg Ile Asp His Gln Val Lys Ile Arg Gly				
1895		1900		1905
Gln Arg Ile Glu Leu Gly Glu Ile Glu His His Leu Leu Thr His				
1910		1915		1920
Asp Met Val Gln Glu Ala Ala Val Leu Ala Val Asp Thr Gly Ala				
1925		1930		1935

Gly Asp 1940	Gln Met Ile Cys Ala 1945	Tyr Phe Thr Ala Asp 1950	Gln Glu Leu
Ser Ser 1955	Gln Glu Leu Arg Arg 1960	His Ala Ala Glu Gly 1965	Leu Pro Gly
Tyr Met 1970	Ile Pro Ser Val Phe 1975	Met Gln Leu Asp Glu 1980	Leu Pro Leu
Thr Gly 1985	Asn Gly Lys Ile Asp 1990	Arg Arg Ala Leu Pro 1995	Glu Pro Asp
Ile Ala 2000	Gln Ala Ala Gln Lys 2005	Glu Tyr Thr Ala Pro 2010	Arg Ser Gly
Thr Glu 2015	Ala Gln Leu Ala Asp 2020	Leu Trp Gln Glu Val 2025	Leu Asn Val
Pro Lys 2030	Ile Gly Val His Asp 2035	Asn Phe Phe Glu Leu 2040	Gly Gly His
Ser Leu 2045	Leu Gly Met Thr Leu 2050	Ile Ala Arg Ile Gln 2055	Gln Glu Met
Asn Val 2060	Asp Leu Gln Leu Lys 2065	Asp Leu Phe Gln Ala 2070	Pro Thr Ile
Glu Ser 2075	Leu Ala Gln Ala Ala 2080	Ala Lys Ser Glu Lys 2085	Lys Ser Ala
Val Tyr 2090	Ile Glu Ala Ala Pro 2095	Asp Arg Glu Thr Tyr 2100	Pro Val Ser
Ser Ala 2105	Gln Lys Arg Leu Tyr 2110	Val Leu Gln Gln Ile 2115	Glu Gly Ala
Glu Lys 2120	Ser Tyr Asn Met Pro 2125	Ala Val Leu Gln Leu 2130	Glu Gly Lys
Leu Asp 2135	Leu Lys Arg Leu Glu 2140	Ser Ala Ala Gln Met 2145	Leu Ile Lys

Arg His 2150	Glu Ala Phe Arg Thr 2155	Thr Phe Glu Ile Arg 2160	Asn Gly Glu
Pro Val 2165	Gln Arg Ile Trp Glu 2170	Ala Ala Glu Leu Thr 2175	Ile Asp Val
Ile Asp 2180	Ala Asp Glu Gln Glu 2185	Ala Glu Lys Leu Ile 2190	Lys Glu Phe
Ile Arg 2195	Pro Phe Asp Leu Thr 2200	Lys Ala Pro Leu Phe 2205	Arg Met Ser
Ile Ile 2210	Arg Val Thr Glu Glu 2215	Lys His Leu Leu Leu 2220	Val Asp Met
His His 2225	Ile Ile Ser Asp Gly 2230	Ala Ser Val Ser Val 2235	Leu Ile Asp
Glu Met 2240	Thr Arg Leu Tyr Ala 2245	Gly Glu Ala Leu Glu 2250	Pro Leu Arg
Ile Gln 2255	Tyr Lys Asp Tyr Ala 2260	Val Trp Gln Gln His 2265	Leu Leu Thr
Glu Arg 2270	His Lys Met Gln Glu 2275	Glu Tyr Trp Leu Lys 2280	Glu Leu Asp
Gly Glu 2285	Leu Pro Val Leu Thr 2290	Leu Pro Thr Asp Tyr 2295	Pro Arg Pro
Ser Val 2300	Gln Thr Phe Glu Gly 2305	Ser Arg Ile Ser Phe 2310	Ser Leu Lys
Pro Glu 2315	Leu Val Gln Gln Leu 2320	Arg Arg Leu Ala Lys 2325	Glu Thr Glu
Ser Thr 2330	Leu Tyr Met Val Leu 2335	Ala Ala Ser Tyr Ser 2340	Thr Phe Leu
Ser Lys 2345	Leu Ser Gly Gln Ser 2350	Glu Val Ile Phe Gly 2355	Ser Pro Ala

Ala Gly	Arg Pro His	Ala Asp	Leu Ser Arg	Ile Ile	Gly Met Phe
2360		2365		2370	
Val Asn	Thr Leu Ala	Ile Arg	Thr Arg Pro	Glu Gly	Asp Lys Pro
2375		2380		2385	
Phe Ser	Ala Phe Leu	Glu Glu	Val Lys Glu	Thr Thr	Leu Gly Ala
2390		2395		2400	
Phe Glu	His Gln Asp	Tyr Pro	Phe Glu Glu	Leu Ile	Glu Lys Leu
2405		2410		2415	
Asn Ile	Gln Arg Asp	Met Ser	Arg Asn Pro	Leu Phe	Asp Ala Val
2420		2425		2430	
Phe Ser	Met Gln Asn	Ala Asp	Leu Lys Asp	Leu Ser	Met Glu Gly
2435		2440		2445	
Val Thr	Leu Lys Pro	Tyr Asp	Phe Ala His	Gln Thr	Ala Lys Phe
2450		2455		2460	
Asp Leu	Thr Leu Thr	Ala Ala	Glu Glu Asp	Gly Leu	Leu Val Phe
2465		2470		2475	
Glu Met	Glu Tyr Asn	Thr Asp	Leu Phe Lys	Arg Glu	Ser Ile Lys
2480		2485		2490	
Arg Trp	Ser Gly Tyr	Trp Val	Asn Leu Leu	Glu Ala	Val Ala Glu
2495		2500		2505	
Thr Pro	Asp Ala Ser	Leu Ser	Asp Leu Ser	Leu Leu	Asp Glu Ala
2510		2515		2520	
Glu Lys	Arg Arg Ile	Val Gln	Lys Trp Asn	Glu Thr	Lys Leu Ala
2525		2530		2535	
Val Pro	Gln Asp Lys	Thr Val	His Glu Leu	Phe Glu	Ala Gln Val
2540		2545		2550	
Leu Arg	Thr Pro Asp	Arg Gly	Ala Ala Val	Tyr Asn	Gly Val Lys
2555		2560		2565	
Trp Thr	Tyr Lys Glu	Leu Asn	Ala Arg Ala	Asn Arg	Leu Ala Arg



2570														
Leu	Leu	Ile	Glu	Lys	Gly	Ala	Gly	Pro	Glu	Gln	Arg	Val	Gly	Ile
2585						2590					2595			
Met	Val	Lys	Pro	Ser	Leu	Glu	Met	Ala	Ala	Gly	Val	Leu	Ala	Ile
2600						2605					2610			
Leu	Lys	Ala	Gly	Ala	Ala	Tyr	Val	Pro	Ile	Asp	Pro	Gly	Tyr	Pro
2615						2620					2625			
Ala	Glu	Arg	Ile	Gly	Tyr	Val	Leu	Lys	Asp	Ser	Gly	Ala	Glu	Leu
2630						2635					2640			
Leu	Leu	Thr	Gln	Thr	Asn	Leu	Ala	Val	Pro	Glu	Glu	Phe	Ser	Gly
2645						2650					2655			
Glu	Thr	Leu	Leu	Leu	Asp	Ser	Met	Leu	Ser	Glu	Glu	Ile	Thr	Asn
2660						2665					2670			
Asp	Asp	Glu	Val	Asn	Pro	Gln	Ala	Gly	Thr	Gln	Pro	Asn	Asn	Leu
2675						2680					2685			
Ala	Tyr	Leu	Ile	Tyr	Thr	Ser	Gly	Thr	Thr	Gly	Gln	Pro	Lys	Gly
2690						2695					2700			
Val	Met	Val	Glu	His	Gln	Ser	Leu	Val	Asn	Leu	Cys	Tyr	Trp	His
2705						2710					2715			
Asn	Asp	Ala	Phe	Ala	Val	Thr	Glu	Gln	Asp	Lys	Ser	Ala	Lys	Tyr
2720						2725					2730			
Ala	Gly	Phe	Gly	Phe	Asp	Ala	Ser	Val	Trp	Glu	Met	Phe	Pro	Tyr
2735						2740					2745			
Trp	Ile	Ala	Gly	Ala	Glu	Leu	His	Ile	Ile	Asp	Glu	Ala	Ile	Arg
2750						2755					2760			
Met	Asp	Ile	Thr	Arg	Leu	Asn	Glu	Tyr	Phe	Glu	Glu	Asn	Gly	Ile
2765						2770					2775			
Thr	Ile	Thr	Phe	Leu	Pro	Thr	Gln	Leu	Cys	Glu	Gln	Phe	Met	Glu
2780						2785					2790			

Leu Asp 2795	Asn Gln Ser Leu Arg 2800	Val Leu Leu Thr Gly 2805	Gly Asp Lys
Leu Lys 2810	Arg Ile Glu Lys Arg 2815	Asn Tyr Thr Leu Val 2820	Asn Asn Tyr
Gly Pro 2825	Thr Glu Asn Thr Val 2830	Val Ala Thr Ser Thr 2835	Ala Ile Asp
Pro Asp 2840	Glu Gly Met Leu Ser 2845	Ile Gly Lys Pro Ile 2850	Ala Asn Thr
Arg Ala 2855	Tyr Val Leu Gly Gln 2860	Asn Asn Glu Val Gln 2865	Pro Val Gly
Val Ala 2870	Gly Glu Leu Cys Ile 2875	Ala Gly Arg Gly Leu 2880	Ala Arg Gly
Tyr Leu 2885	Asn Lys Pro Glu Glu 2890	Thr Ala Lys Arg Phe 2895	Thr Glu Asp
Pro Phe 2900	Val Pro Gly Glu Arg 2905	Met Tyr Arg Thr Gly 2910	Asp Ala Val
Lys Trp 2915	Leu Glu Asp Gly Arg 2920	Leu Glu Tyr Ile Gly 2925	Arg Ile Asp
Gln Gln 2930	Val Lys Ile Arg Gly 2935	Phe Arg Ile Glu Leu 2940	Ser Glu Ile
Glu Val 2945	Gln Leu Ala Arg Leu 2950	Ser Glu Val Gln Glu 2955	Ala Val Val
Thr Asp 2960	Ile Glu Asp Ala Tyr 2965	Gly Asn Lys Ala Leu 2970	Cys Gly Tyr
Val Val 2975	Ala Asp Glu Gln Leu 2980	Asp Thr Glu Ser Leu 2985	Ala Arg Lys
Leu Gly 2990	Gln Thr Leu Pro Asp 2995	Tyr Met Val Pro Ala 3000	Tyr Trp Val

Gln	Leu	Asp	Glu	Leu	Pro	Val	Thr	Ala	Asn	Gly	Lys	Val	Asp	Arg
3005						3010					3015			
Arg	Ala	Leu	Pro	Gln	Pro	Asp	Val	Glu	Ala	Gln	Thr	Ala	Glu	Tyr
3020						3025					3030			
Lys	Ala	Pro	Arg	Thr	Glu	Thr	Glu	Gln	Leu	Leu	Ala	Asp	Ile	Trp
3035						3040					3045			
Gln	Asp	Val	Leu	Gly	Ile	Asp	Arg	Ile	Gly	Val	Thr	Asp	Asn	Phe
3050						3055					3060			
Phe	Ala	Leu	Gly	Gly	Asp	Ser	Ile	Lys	Gly	Ile	Gln	Met	Ala	Ser
3065						3070					3075			
Arg	Leu	Gln	Gln	His	Gly	Trp	Lys	Leu	Glu	Met	Lys	Asp	Leu	Phe
3080						3085					3090			
Gln	His	Pro	Thr	Ile	Gly	Glu	Leu	Ser	Ala	Tyr	Val	Gln	Ala	Ala
3095						3100					3105			
Asp	Asp	Gln	Pro	Ile	Asp	Gln	Asn	Pro	Val	Glu	Gly	Glu	Val	Thr
3110						3115					3120			
Leu	Thr	Pro	Ile	Gln	Arg	Trp	Phe	Phe	Glu	Arg	Lys	Phe	Thr	Asn
3125						3130					3135			
Glu	His	His	Trp	Asn	Gln	Ser	Val	Met	Leu	His	Ala	Pro	Ser	Gly
3140						3145					3150			
Phe	Asp	Pro	Glu	Ala	Ala	Gly	Lys	Ala	Leu	Thr	Lys	Met	Ile	Glu
3155						3160					3165			
His	His	Asp	Ala	Leu	Arg	Met	Val	Tyr	Gln	Arg	Asn	Gly	Asp	Gly
3170						3175					3180			
Ile	Val	Gln	Tyr	Asn	Arg	Gly	Leu	Glu	Glu	Thr	Ala	Val	Arg	Pro
3185						3190					3195			
Glu	Val	Ile	Arg	Phe	Asn	Glu	Ser	Gly	Ala	Glu	Leu	Glu	Ala	Ala
3200						3205					3210			

Val	Leu	Lys	Glu	Ser	Asn	Arg	Ile	Gln	Ser	Ser	Ile	Asn	Leu	Thr
3215						3220					3225			
Glu	Gly	Pro	Leu	Leu	Lys	Ala	Ala	Ile	Phe	Glu	Thr	Asp	Gln	Gly
3230						3235					3240			
Asp	His	Leu	Leu	Ile	Val	Ile	His	His	Leu	Val	Val	Asp	Gly	Ile
3245						3250					3255			
Ser	Trp	Arg	Ile	Leu	Leu	Glu	Asp	Phe	Ala	Ala	Gly	Tyr	Ala	Gln
3260						3265					3270			
Ala	Glu	Lys	Gly	Glu	Pro	Ile	Ile	Leu	Gln	Glu	Lys	Thr	His	Ser
3275						3280					3285			
Phe	Ala	Glu	Tyr	Ala	Ala	Arg	Leu	Lys	Glu	Tyr	Ala	Arg	Ser	Lys
3290						3295					3300			
Ala	Phe	Ala	Lys	Glu	Ile	Gly	Tyr	Trp	Gln	Glu	Val	Glu	Lys	Ala
3305						3310					3315			
Glu	Thr	Ala	Ser	Leu	Pro	Lys	Asp	Asp	Glu	Ala	Glu	Asp	Lys	Arg
3320						3325					3330			
Met	His	His	Thr	Lys	Thr	Ala	Glu	Phe	Ser	Leu	Ser	Lys	Glu	Glu
3335						3340					3345			
Thr	Glu	Gln	Leu	Met	Thr	Lys	Val	His	Glu	Ala	Tyr	Asn	Thr	Glu
3350						3355					3360			
Met	Asn	Asp	Ile	Leu	Leu	Thr	Ala	Leu	Gly	Leu	Ala	Leu	Lys	Glu
3365						3370					3375			
Trp	Thr	Gly	Gln	Glu	Asp	Phe	Ile	Ile	Cys	Leu	Glu	Gly	His	Gly
3380						3385					3390			
Arg	Glu	Asp	Ile	Met	Glu	Gly	Leu	Asn	Ile	Ser	Arg	Thr	Val	Gly
3395						3400					3405			
Trp	Phe	Thr	Ser	Gln	Phe	Pro	Ala	Leu	Ile	Gln	Leu	Arg	His	Ser
3410						3415					3420			
Glu	Asp	Ile	Gly	Tyr	Gln	Ile	Lys	Gln	Ile	Lys	Glu	Glu	Leu	Arg

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His Ile Pro Asn Lys Gly Ile Gly Tyr Gly Ile Tyr Arg Tyr Leu				
3440		3445		3450
Thr Glu Glu Gly Lys Lys Ala Gln Pro Ile Lys His Asp Ile Ser				
3455		3460		3465
Phe Asn Tyr Leu Gly Gln Phe Ala Glu Met Ala Asp Ser Gly Leu				
3470		3475		3480
Phe Thr Arg Ser Ala Leu Pro Ser Gly Asp Pro Leu Ser Pro Glu				
3485		3490		3495
Thr Glu Lys Pro Asn Ala Leu Asp Ile Val Gly Tyr Ile Glu Asn				
3500		3505		3510
Gly Ile Leu Thr Met Ser Ile Ala Tyr His Ser Leu Glu Tyr Lys				
3515		3520		3525
Glu Ser Thr Val Ala Ala Val Ala Ala Ser Phe Lys Thr Tyr Leu				
3530		3535		3540
Leu Gln Leu Ile Asp His Cys Leu Glu Leu Asp Gly Gly Glu Leu				
3545		3550		3555
Thr Pro Ser Asp Leu Gly Asp Asp Glu Leu Thr Leu Glu Glu Leu				
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Asp Lys Leu Met Glu Ile Phe				
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ccttttgcaa gcacccattt ttcgtcaaaa tgaagacttg taacgcctat acatttcctg	180
cgacaaacac ctcatattgat cgtcacacct tttttatatg acgaagacgt caaataaagc	240
aggtgctttc tcaattcagt ggatgaaaga aattttctaag cttgacatgt ttcataactca	300
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ccttcttcaa gaattagaat gtcctaaggc gctttcgatt attcgtttta tttttacggc	420
cgaaaagcgg gagggaaaac gtttcaaata cattcttggt tttggtacta ttaagaaaaa	480
tgcaggaaaag gaacgaacgt atg tca cta ctg act gtt aaa gag tta act gga	533
Met Ser Leu Leu Thr Val Lys Glu Leu Thr Gly	
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Gly Tyr Thr Arg Asn Pro Val Leu Arg Asp Val Ser Phe Ala Ile Glu	
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cgg gag cag atc gtc ggg ctg atc ggt ttg aac gga gcg ggg aaa agc	629
Arg Glu Gln Ile Val Gly Leu Ile Gly Leu Asn Gly Ala Gly Lys Ser	
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acg acg atc cgg cat atc atc ggc tta atg gaa ccg cac aaa gga tct	677
Thr Thr Ile Arg His Ile Ile Gly Leu Met Glu Pro His Lys Gly Ser	
45 50 55	
gtt gaa ttg aac ggc aaa acg ttc atg gac gat ccg gaa agc tac cgt	725
Val Glu Leu Asn Gly Lys Thr Phe Met Asp Pro Glu Ser Tyr Arg	
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tcc caa ttt acg ttt att ccg gaa acg ccg att tta tat gaa gag ctg	773
Ser Gln Phe Thr Phe Ile Pro Glu Thr Pro Ile Leu Tyr Glu Glu Leu	
80 85 90	
aca ttg aag gag cat ttg gag ctg act gcg atg gcg tac ggg ctt tcg	821
Thr Leu Lys Glu His Leu Glu Leu Thr Ala Met Ala Tyr Gly Leu Ser	
95 100 105	
aag gaa acg ttc gag aaa agg ctg ccg ccg ctt ttg aag gaa ttc aga	869
Lys Glu Thr Phe Glu Lys Arg Leu Pro Pro Leu Leu Lys Glu Phe Arg	
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atg gag aag cgt ctg aaa tgg ttc ccg gcc cat ttt tca aaa gga atg	917
Met Glu Lys Arg Leu Lys Trp Phe Pro Ala His Phe Ser Lys Gly Met	
125 130 135	
aag cag aag gtt atg atc atg tgc gct ttc ctt gtc gaa cct gac ctg	965
Lys Gln Lys Val Met Ile Met Cys Ala Phe Leu Val Glu Pro Asp Leu	
140 145 150 155	
tac att ata gac gaa ccg ttt ctc ggt ctt gat ccg ctg gcg atc aat	1013
Tyr Ile Ile Asp Glu Pro Phe Leu Gly Leu Asp Pro Leu Ala Ile Asn	
160 165 170	

gcc ctt ctc gag cgg atg aat gaa gcg aag aaa aac ggc tcg gcc gtt 1061  
 Ala Leu Leu Glu Arg Met Asn Glu Ala Lys Lys Asn Gly Ser Ala Val  
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                   190                                  195                                  200

ttc atc att ctc cat aac ggc gaa gtg cgg gcg aaa gga acg ctt gaa 1157  
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                   205                                  210                                  215

gag ctc aga gaa cag ttt tcg atg gaa gaa gcg agc ctc gat gac ctg 1205  
 Glu Leu Arg Glu Gln Phe Ser Met Glu Glu Ala Ser Leu Asp Asp Leu  
                   220                                  225                                  230                                  235

tat ctt gaa ctg acg aag gaa gag agc tat gaa tagcattctg gggatttggga 1258  
 Tyr Leu Glu Leu Thr Lys Glu Glu Ser Tyr Glu  
                                   240                                  245

agacaagaat tgaggagtat gtcaaagaaa caagatcata tttgaaatac atgctgaatg 1318

accaccttgt catcgatcatg atttttttcc tcgctggagc tgcgagctgg tacagcaaat 1378

ggctgaaaga gatgcccga ggttttccag cctattgggt gatggccgctc atcttttcgc 1438

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Gly Leu Ile Gly Leu Asn Gly Ala Gly Lys Ser Thr Thr Ile Arg His  
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Ile Ile Gly Leu Met Glu Pro His Lys Gly Ser Val Glu Leu Asn Gly

50

55

60

Lys Thr Phe Met Asp Asp Pro Glu Ser Tyr Arg Ser Gln Phe Thr Phe  
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Ile Pro Glu Thr Pro Ile Leu Tyr Glu Glu Leu Thr Leu Lys Glu His  
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Leu Glu Leu Thr Ala Met Ala Tyr Gly Leu Ser Lys Glu Thr Phe Glu  
 100 105 110

Lys Arg Leu Pro Pro Leu Leu Lys Glu Phe Arg Met Glu Lys Arg Leu  
 115 120 125

Lys Trp Phe Pro Ala His Phe Ser Lys Gly Met Lys Gln Lys Val Met  
 130 135 140

Ile Met Cys Ala Phe Leu Val Glu Pro Asp Leu Tyr Ile Ile Asp Glu  
 145 150 155 160

Pro Phe Leu Gly Leu Asp Pro Leu Ala Ile Asn Ala Leu Leu Glu Arg  
 165 170 175

Met Asn Glu Ala Lys Lys Asn Gly Ser Ala Val Leu Met Ser Thr His  
 180 185 190

Ile Leu Ala Thr Ala Glu Arg Tyr Cys Asp Ser Phe Ile Ile Leu His  
 195 200 205

Asn Gly Glu Val Arg Ala Lys Gly Thr Leu Glu Glu Leu Arg Glu Gln  
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<212> DNA

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tgcagaccgg cttctttggg ccttctcctt atgatatggg aagacaggtc tctgaaaggt 180

ctgaagcact ctatgcactg agcttcagcg gcatcatcag caaggaaaaa ttcattctgt 240

catgttcatt caatacagag gaatatgaca ggcagacatc acaggagctc atggacagat 300

tcaaagcttt cctgacagca ttgatcgacc attgtacagc taaagaagaa cgcaatttta 360

caccgagtga tttttctgcc ggcgatcttg agatggaaga aatgggagac ctgtttgacg 420

ttcttgaaga aaacttgaaa taaccaccga ggacttgccc gcttgtcaag cgggagagcc 480

tatgaaaggg ggatacgatc ttg agc cag ttt aaa aaa gaa cat gtc caa gac 533  
Leu Ser Gln Phe Lys Lys Glu His Val Gln Asp  
1 5 10

ata tac tat ttg tca ccg atg cag gaa ggg atg ctg ttt cat acg ctg 581  
Ile Tyr Tyr Leu Ser Pro Met Gln Glu Gly Met Leu Phe His Thr Leu  
15 20 25

ctg cat ccg ggg caa ggc ttt tat att gaa caa atc agc atg cag gtg 629  
Leu His Pro Gly Gln Gly Phe Tyr Ile Glu Gln Ile Ser Met Gln Val  
30 35 40

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Lys Gly Ser Phe Gln Lys Asp Val Leu Glu Lys Ser Met Asn Val Ile  
45 50 55

atc ggc agg tat gat ata ttc cga acc gtt ttc gtt cat gaa aaa atg 725  
Ile Gly Arg Tyr Asp Ile Phe Arg Thr Val Phe Val His Glu Lys Met  
60 65 70 75

aaa cgt ccg gtt caa gtc gtt tta aag gaa agg tca ttt cag gca gaa 773  
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80 85 90

gaa att gat cta tca gga ctt tct gaa gca gaa caa aat gag aga att 821  
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95 100 105

gaa gat tat aaa cga aaa gat aaa gaa aaa gga ttt aac ctc tca aaa 869  
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110 115 120

gac att ccg atg aga acg gcg gtt ttt aag aag ggg cag gat cgt tac 917  
Asp Ile Pro Met Arg Thr Ala Val Phe Lys Lys Gly Gln Asp Arg Tyr  
125 130 135

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Glu Trp Val Trp Ser Tyr His His Ile Leu Leu Asp Gly Trp Cys Phe	
140 145 150 155	
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Gly Ile Val Val Gln Glu Leu Phe Glu Val Tyr Asn Ala Leu Arg Glu	
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Asn Arg Pro Tyr Ser Leu Gly Pro Val Arg Pro Tyr Lys Glu Tyr Ile	
175 180 185	
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Lys Trp Leu Glu Ser Gln Asp Lys Gln Lys Ser Leu Val Tyr Trp Glu	
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205 210 215	
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Leu Pro Lys Glu Asp Thr Glu Ala Phe Thr Gln Leu Ala Lys Ala His	
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cat acc acg ttg agc acg gcg ctt cag gcg gtg tgg tcg gtg ctg ctc	1301
His Thr Thr Leu Ser Thr Ala Leu Gln Ala Val Trp Ser Val Leu Leu	
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Ser Arg Tyr Gln Arg Ser Arg Asp Leu Ile Phe Gly Thr Val Val Ser	
270 275 280	
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Gly Arg Pro Ala Asp Ile Gln Gly Val Glu His Met Val Gly Leu Phe	
285 290 295	
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Ile Asn Val Val Pro Lys Arg Ala Thr Phe Gly Pro Gln Thr Thr Phe	
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320 325 330	
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His Gln Tyr Val Pro Leu Tyr Glu Ile Gln Ser His Ile Ala Ala Pro	
335 340 345	
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Asn Leu Ile Asp His Ile Ile Val Phe Glu Asn Tyr Pro Leu Gln Glu	
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Ile Ser Val Phe Glu Lys Ser Asn Tyr Asp Leu Asn Leu Leu Ala Ser	
380 385 390 395	
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430 435 440	
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Glu Glu Leu Ala Gly Arg Ala Ala Ser Leu Ser Phe His Lys His Thr	
575 580 585	
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aca agg gtt gta aaa gag aca aac tac atc agc ctt tcc gag aaa gac Thr Arg Val Val Lys Glu Thr Asn Tyr Ile Ser Leu Ser Glu Lys Asp 640 645 650			2453
acc ttg ctg tcc ctt tca aac tat gcg ttt gac ggc ttc aca ttt gat Thr Leu Leu Ser Leu Ser Asn Tyr Ala Phe Asp Gly Phe Thr Phe Asp 655 660 665			2501
ctg tac ggc gcg ctg tta aac gga gca aag ctg gtg gtg gcc gat cag Leu Tyr Gly Ala Leu Leu Asn Gly Ala Lys Leu Val Val Ala Asp Gln 670 675 680			2549
gcg acg att ctc cat atc ggc aag ctg aca gaa gcg att cag aag gaa Ala Thr Ile Leu His Ile Gly Lys Leu Thr Glu Ala Ile Gln Lys Glu 685 690 695			2597
aac atc aca gtc atg ttt gtg aca acg gcg ctg ttc aac ttg ctg gtt Asn Ile Thr Val Met Phe Val Thr Thr Ala Leu Phe Asn Leu Leu Val 700 705 710 715			2645
gat gcg gga aca ggg tgg atg aaa ggg att cgc aaa gtc ctg ttc ggc Asp Ala Gly Thr Gly Trp Met Lys Gly Ile Arg Lys Val Leu Phe Gly 720 725 730			2693
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agc ggt aca gga gta tcg cgc ggc tat ttg aac agg ccg gaa ctg act Ser Gly Thr Gly Val Ser Arg Gly Tyr Leu Asn Arg Pro Glu Leu Thr 815 820 825			2981

gcg gaa aaa ttc gcg ccg cat ccg ttt aac agc ggt gaa acg atg tac	3029
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830 835 840	
agg acg gga gat ctg gcc cgc tgg ctg ccg gac ggc aat atc gac ttc	3077
Arg Thr Gly Asp Leu Ala Arg Trp Leu Pro Asp Gly Asn Ile Asp Phe	
845 850 855	
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Ile Gly Arg Ile Asp Asp Gln Val Lys Ile Arg Gly His Arg Ile Glu	
860 865 870 875	
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Leu Gly Glu Ile Glu Glu Gln Leu Met Arg Cys Gln Gly Val Lys Glu	
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Ala Val Val Thr Ala Arg Lys Ser Gly Asn Gly Asp Ala Ala Leu Thr	
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gct tat gtc gtc ccg gtg cag gga act gag gtt gca aac gag gag gtt	3269
Ala Tyr Val Val Pro Val Gln Gly Thr Glu Val Ala Asn Glu Glu Val	
910 915 920	
cgc cgc caa ttg gcg cgg agg cta ccg gct tac atg gtg ccg gct gcg	3317
Arg Arg Gln Leu Ala Arg Arg Leu Pro Ala Tyr Met Val Pro Ala Ala	
925 930 935	
tat atc atg ctt gaa gag ctg ccg ctt acc gct aac gga aaa gtc aac	3365
Tyr Ile Met Leu Glu Glu Leu Pro Leu Thr Ala Asn Gly Lys Val Asn	
940 945 950 955	
cga cgc ctt ctc cct gaa gcc gat ggc cgg ccg aat tca aca gag cgc	3413
Arg Arg Leu Leu Pro Glu Ala Asp Gly Arg Pro Asn Ser Thr Glu Arg	
960 965 970	
cgt gca ccc cgc aat gct acg gaa gaa aag ctt gca gtg att tgg tct	3461
Arg Ala Pro Arg Asn Ala Thr Glu Glu Lys Leu Ala Val Ile Trp Ser	
975 980 985	
gag gtt ctc ggc aga cag cag atc gga ata gac gag aac ttt ttt gaa	3509
Glu Val Leu Gly Arg Gln Gln Ile Gly Ile Asp Glu Asn Phe Phe Glu	
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atc ggg gga cat tca ttg aaa gcc atg gcc gtc gcc tcc cgg atg	3554
Ile Gly Gly His Ser Leu Lys Ala Met Ala Val Ala Ser Arg Met	
1005 1010 1015	
ctg aaa gat ctc gca atc gat gtt ccg gtg aat gtg ttg ttt gaa	3599
Leu Lys Asp Leu Ala Ile Asp Val Pro Val Asn Val Leu Phe Glu	
1020 1025 1030	
atg ccc aca atc gag ggc ctc gcg gct tat atc gac caa ggc ggc	3644
Met Pro Thr Ile Glu Gly Leu Ala Ala Tyr Ile Asp Gln Gly Gly	
1035 1040 1045	

cat gtg gat gaa gtg aaa aaa acc gtc ttc aat cag gca agc acc	3689
His Val Asp Glu Val Lys Lys Thr Val Phe Asn Gln Ala Ser Thr	
1050 1055 1060	
cgc cat ttg ttc gct ttc ccg cct gtc ctc gga tac ggc atc atg	3734
Arg His Leu Phe Ala Phe Pro Pro Val Leu Gly Tyr Gly Ile Met	
1065 1070 1075	
tac ggc aag ctg gcc gaa caa atg ccg gaa tac agg att cac gcg	3779
Tyr Gly Lys Leu Ala Glu Gln Met Pro Glu Tyr Arg Ile His Ala	
1080 1085 1090	
ttc gac ttt ata gaa agc gat gac cgc gct gtg cgc tat gca gaa	3824
Phe Asp Phe Ile Glu Ser Asp Asp Arg Ala Val Arg Tyr Ala Glu	
1095 1100 1105	
gcc atc tcc gac ctt cag cct gaa ggg ccg ctg aca ttg atc ggc	3869
Ala Ile Ser Asp Leu Gln Pro Glu Gly Pro Leu Thr Leu Ile Gly	
1110 1115 1120	
tat tca gcc ggc tgc gga ctt gcc ttt gaa gtg gcg caa gcg ctc	3914
Tyr Ser Ala Gly Cys Gly Leu Ala Phe Glu Val Ala Gln Ala Leu	
1125 1130 1135	
gaa aag aac gga cgg aag gtc gaa aag ctg ctg atg atc gac tca	3959
Glu Lys Asn Gly Arg Lys Val Glu Lys Leu Leu Met Ile Asp Ser	
1140 1145 1150	
tat atg aag aac gat gtc agc gat tta gaa ggg ccg tca att gaa	4004
Tyr Met Lys Asn Asp Val Ser Asp Leu Glu Gly Arg Ser Ile Glu	
1155 1160 1165	
gcc gat acg gcc gcc ttg atg gaa gcc aac aag gac aat gaa tat	4049
Ala Asp Thr Ala Ala Leu Met Glu Ala Asn Lys Asp Asn Glu Tyr	
1170 1175 1180	
atg aaa atc aag acg gtt gcc gat ggc atc gct aaa aag atg aca	4094
Met Lys Ile Lys Thr Val Ala Asp Gly Ile Ala Lys Lys Met Thr	
1185 1190 1195	
gcc tat tat tct tac ttt gtc aat ctt gtc cat caa gga acg gtc	4139
Ala Tyr Tyr Ser Tyr Phe Val Asn Leu Val His Gln Gly Thr Val	
1200 1205 1210	
agc tcg gag att cat ttg atc aaa tca gag cac gca aaa ccg ctc	4184
Ser Ser Glu Ile His Leu Ile Lys Ser Glu His Ala Lys Pro Leu	
1215 1220 1225	
ccg gca tgg ctt tcg ttg tgg aaa gaa gga acg gag tct tca tat	4229
Pro Ala Trp Leu Ser Leu Trp Lys Glu Gly Thr Glu Ser Ser Tyr	
1230 1235 1240	
gat gaa tat caa ggc gct gga aga cat gat gaa atg ctt gcg gac	4274
Asp Glu Tyr Gln Gly Ala Gly Arg His Asp Glu Met Leu Ala Asp	
1245 1250 1255	
ggc ttt gtt aaa agc aac gca gat ctc atc aga cag att ttg ggc	4319

Gly Phe Val Lys Ser Asn Ala Asp Leu Ile Arg Gln Ile Leu Gly  
1260 1265 1270

gaa cgt gcc gct gta atc gga ggt gca tgatgcatga acgagatcat 4366  
Glu Arg Ala Ala Val Ile Gly Gly Ala  
1275 1280

taagcagttt ggagcgccgg caagcgggtat gcagttgatc tgtttcccgt ttgccggggg 4426

atattcggca tcattcagac cgcttcacga acatttaaaa acagattttg atatgctggc 4486

gatcgaaccg cctggacacg gcacaaatcg aatggcgctt gtcgacaatt tggaaaagct 4546

cgccgatttg tatatagcgg cgcttaagcc gcggttttcc tctcaattcg tgctgttcgg 4606

ccacagtatg ggcgcatgg ttgtttacag gctggcgcaa aagcttgaac aagaagggat 4666

ctttccggca gccgctgtga tatcagcgat acagccgcc catattcagc ggcaaaaggt 4726

gtctcaccaa aaggatgacg cttttctcga ccatctcatt cagcttggcg gaatacccaa 4786

agaactggca gagcacaggg aaatgatgaa ctttttctg ccttcgttca gagcggacta 4846

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<212> PRT  
<213> Bacillus licheniformis

<400> 18

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Gly Phe Tyr Ile Glu Gln Ile Ser Met Gln Val Lys Gly Ser Phe Gln  
35 40 45

Lys Asp Val Leu Glu Lys Ser Met Asn Val Ile Ile Gly Arg Tyr Asp  
50 55 60

Ile Phe Arg Thr Val Phe Val His Glu Lys Met Lys Arg Pro Val Gln  
65 70 75 80

Val Val Leu Lys Glu Arg Ser Phe Gln Ala Glu Glu Ile Asp Leu Ser  
85 90 95

Gly Leu Ser Glu Ala Glu Gln Asn Glu Arg Ile Glu Asp Tyr Lys Arg  
100 105 110

Lys Asp Lys Glu Lys Gly Phe Asn Leu Ser Lys Asp Ile Pro Met Arg  
115 120 125

Thr Ala Val Phe Lys Lys Gly Gln Asp Arg Tyr Glu Trp Val Trp Ser  
130 135 140

Tyr His His Ile Leu Leu Asp Gly Trp Cys Phe Gly Ile Val Val Gln  
145 150 155 160

Glu Leu Phe Glu Val Tyr Asn Ala Leu Arg Glu Asn Arg Pro Tyr Ser  
165 170 175

Leu Gly Pro Val Arg Pro Tyr Lys Glu Tyr Ile Lys Trp Leu Glu Ser  
180 185 190

Gln Asp Lys Gln Lys Ser Leu Val Tyr Trp Glu His His Leu Ala Gly  
195 200 205

Phe Glu Gly Gln Thr Thr Phe Ser Glu Gln Arg Lys Asn Pro Glu Gln  
210 215 220

Ala Gly Asn Gln Pro Glu Glu Leu Leu Phe Thr Leu Pro Lys Glu Asp  
225 230 235 240

Thr Glu Ala Phe Thr Gln Leu Ala Lys Ala His His Thr Thr Leu Ser  
245 250 255

Thr Ala Leu Gln Ala Val Trp Ser Val Leu Leu Ser Arg Tyr Gln Arg  
260 265 270

Ser Arg Asp Leu Ile Phe Gly Thr Val Val Ser Gly Arg Pro Ala Asp  
275 280 285

Ile Gln Gly Val Glu His Met Val Gly Leu Phe Ile Asn Val Val Pro  
290 295 300

Lys Arg Ala Thr Phe Gly Pro Gln Thr Thr Phe Thr Glu Leu Val Ala  
305 310 315 320

Asp Leu Gln Lys Gln Ala Leu Glu Ala Glu Pro His Gln Tyr Val Pro  
325 330 335



Leu Tyr Glu Ile Gln Ser His Ile Ala Ala Pro Asn Leu Ile Asp His  
 340 345 350

Ile Ile Val Phe Glu Asn Tyr Pro Leu Gln Glu Ala Asn Lys Gln Gln  
 355 360 365

Lys Glu Lys Asn Leu Gly Phe Thr Met Asp Glu Ile Ser Val Phe Glu  
 370 375 380

Lys Ser Asn Tyr Asp Leu Asn Leu Leu Ala Ser Pro Gly Glu Glu Met  
 385 390 395 400

Met Leu Lys Leu Ala Tyr Asn Arg Asn Ile Phe Glu Pro Ser Phe Ile  
 405 410 415

Leu Arg Leu Lys Glu Gln Leu Leu Thr Ala Ile Arg Glu Val Ile Arg  
 420 425 430

Asp Pro Glu Gln Pro Leu Asp Asp Ile Cys Val Val Ser Lys Lys Glu  
 435 440 445

Lys Glu Arg Leu Leu His Glu Phe Asn Gly Gln Val Gln Arg Lys Gln  
 450 455 460

Ile Gly Leu Thr Ile Pro Gln Trp Phe Glu Gln Tyr Ala Glu Ala Leu  
 465 470 475 480

Pro Glu Lys Pro Ala Val Ser Ala Ala Gly Arg Thr Leu Thr Tyr Arg  
 485 490 495

Glu Leu Asn Glu Lys Ala Asn Lys Val Ala His Leu Leu Arg Lys Lys  
 500 505 510

Asn Val Gly Arg Gly Glu Pro Val Ala Leu Leu Phe Arg Arg Ser Pro  
 515 520 525

Glu Met Val Ile Ala Ile Leu Ala Val Leu Lys Ala Gly Gly Ala Tyr  
 530 535 540

Leu Pro Ile Asp Pro Glu Tyr Pro Glu Ala Arg Ile Gln Tyr Met Leu  
 545 550 555 560

Glu Asp Ser Gly Ala Val Cys Met Leu Thr Gln Glu Glu Leu Ala Gly  
565 570 575

Arg Ala Ala Ser Leu Ser Phe His Lys His Thr Ile Leu Ile Asp Asp  
580 585 590

Pro Ala Val Ser Ala Glu Ser Gly Arg Asn Leu Glu Ile Ala Ala Glu  
595 600 605

Pro Asp Asp Leu Ala Tyr Ile Met Tyr Thr Ser Gly Thr Thr Gly Lys  
610 615 620

Pro Lys Gly Asn Leu Thr Thr His Ala Asn Ile Thr Arg Val Val Lys  
625 630 635 640

Glu Thr Asn Tyr Ile Ser Leu Ser Glu Lys Asp Thr Leu Leu Ser Leu  
645 650 655

Ser Asn Tyr Ala Phe Asp Gly Phe Thr Phe Asp Leu Tyr Gly Ala Leu  
660 665 670

Leu Asn Gly Ala Lys Leu Val Val Ala Asp Gln Ala Thr Ile Leu His  
675 680 685

Ile Gly Lys Leu Thr Glu Ala Ile Gln Lys Glu Asn Ile Thr Val Met  
690 695 700

Phe Val Thr Thr Ala Leu Phe Asn Leu Leu Val Asp Ala Gly Thr Gly  
705 710 715 720

Trp Met Lys Gly Ile Arg Lys Val Leu Phe Gly Gly Glu Arg Ser Ser  
725 730 735

Val Ser His Val Lys Lys Ala Phe Ala Ala Met Gly Pro Asp Arg Ile  
740 745 750

Ile His Val Tyr Gly Pro Thr Glu Thr Thr Val Phe Ala Thr Phe Tyr  
755 760 765

Pro Val Asn Arg Met Glu Asp Ser Ala Val Ser Ile Pro Ile Gly Lys  
770 775 780

Pro Ile Asn Glu Thr Asn Ala Tyr Ile Leu Thr Glu Asn Asn Arg Leu

785		790		795		800
Gln Pro Ile Gly Ala Val Gly Glu Leu Cys Leu Ser Gly Thr Gly Val						
	805			810		815
Ser Arg Gly Tyr Leu Asn Arg Pro Glu Leu Thr Ala Glu Lys Phe Ala						
	820			825		830
Pro His Pro Phe Asn Ser Gly Glu Thr Met Tyr Arg Thr Gly Asp Leu						
	835			840		845
Ala Arg Trp Leu Pro Asp Gly Asn Ile Asp Phe Ile Gly Arg Ile Asp						
	850			855		860
Asp Gln Val Lys Ile Arg Gly His Arg Ile Glu Leu Gly Glu Ile Glu						
	865			870		875
						880
Glu Gln Leu Met Arg Cys Gln Gly Val Lys Glu Ala Val Val Thr Ala						
				885		890
						895
Arg Lys Ser Gly Asn Gly Asp Ala Ala Leu Thr Ala Tyr Val Val Pro						
	900			905		910
Val Gln Gly Thr Glu Val Ala Asn Glu Glu Val Arg Arg Gln Leu Ala						
	915			920		925
Arg Arg Leu Pro Ala Tyr Met Val Pro Ala Ala Tyr Ile Met Leu Glu						
	930			935		940
Glu Leu Pro Leu Thr Ala Asn Gly Lys Val Asn Arg Arg Leu Leu Pro						
	945			950		955
						960
Glu Ala Asp Gly Arg Pro Asn Ser Thr Glu Arg Arg Ala Pro Arg Asn						
	965			970		975
Ala Thr Glu Glu Lys Leu Ala Val Ile Trp Ser Glu Val Leu Gly Arg						
	980			985		990
Gln Gln Ile Gly Ile Asp Glu Asn Phe Phe Glu Ile Gly Gly His Ser						
	995			1000		1005
Leu Lys Ala Met Ala Val Ala Ser Arg Met Leu Lys Asp Leu Ala						
	1010			1015		1020

Ile	Asp	Val	Pro	Val	Asn	Val	Leu	Phe	Glu	Met	Pro	Thr	Ile	Glu
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Gly	Leu	Ala	Ala	Tyr	Ile	Asp	Gln	Gly	Gly	His	Val	Asp	Glu	Val
1040						1045					1050			
Lys	Lys	Thr	Val	Phe	Asn	Gln	Ala	Ser	Thr	Arg	His	Leu	Phe	Ala
1055						1060					1065			
Phe	Pro	Pro	Val	Leu	Gly	Tyr	Gly	Ile	Met	Tyr	Gly	Lys	Leu	Ala
1070						1075					1080			
Glu	Gln	Met	Pro	Glu	Tyr	Arg	Ile	His	Ala	Phe	Asp	Phe	Ile	Glu
1085						1090					1095			
Ser	Asp	Asp	Arg	Ala	Val	Arg	Tyr	Ala	Glu	Ala	Ile	Ser	Asp	Leu
1100						1105					1110			
Gln	Pro	Glu	Gly	Pro	Leu	Thr	Leu	Ile	Gly	Tyr	Ser	Ala	Gly	Cys
1115						1120					1125			
Gly	Leu	Ala	Phe	Glu	Val	Ala	Gln	Ala	Leu	Glu	Lys	Asn	Gly	Arg
1130						1135					1140			
Lys	Val	Glu	Lys	Leu	Leu	Met	Ile	Asp	Ser	Tyr	Met	Lys	Asn	Asp
1145						1150					1155			
Val	Ser	Asp	Leu	Glu	Gly	Arg	Ser	Ile	Glu	Ala	Asp	Thr	Ala	Ala
1160						1165					1170			
Leu	Met	Glu	Ala	Asn	Lys	Asp	Asn	Glu	Tyr	Met	Lys	Ile	Lys	Thr
1175						1180					1185			
Val	Ala	Asp	Gly	Ile	Ala	Lys	Lys	Met	Thr	Ala	Tyr	Tyr	Ser	Tyr
1190						1195					1200			
Phe	Val	Asn	Leu	Val	His	Gln	Gly	Thr	Val	Ser	Ser	Glu	Ile	His
1205						1210					1215			
Leu	Ile	Lys	Ser	Glu	His	Ala	Lys	Pro	Leu	Pro	Ala	Trp	Leu	Ser
1220						1225					1230			

Leu Trp Lys Glu Gly Thr Glu Ser Ser Tyr Asp Glu Tyr Gln Gly  
 1235 1240 1245

Ala Gly Arg His Asp Glu Met Leu Ala Asp Gly Phe Val Lys Ser  
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Asn Ala Asp Leu Ile Arg Gln Ile Leu Gly Glu Arg Ala Ala Val  
 1265 1270 1275

Ile Gly Gly Ala  
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 <212> DNA  
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 <222> (501)..(1178)

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 atatgaggct tgagccgatt ggccaaaaaa gcggcatatt cgttgccctt cccgccgtac 120  
 tcccgtttat tcggcagcaa atgccgcttg ggaaaaggcg tgtattcgct ttccctgtct 180  
 tttggagcca ctccgaccag cagcaattcc ggcacttcct gactcgaaaa cagcttttcg 240  
 attgagcgca gactgttgct gtatgccgga tcgaataaat ctcccagggtc atggacgtat 300  
 agaacgggat agcgggtttc accgctcccg tatgaaggag gaagatagat caaaagctcc 360  
 ctcccgaagc atgtatcttt tatcaatgtt ccgtctatca tgttcattac tccattctgc 420  
 acaagtatca tgcctatctt tcctgctgtc tgtttgctaa aatgaaagca gaaaaatc 480  
 atgtgaagag gttgcgtttg atg aag att tac gcc gtt tat atg gat cag ctg 533  
 Met Lys Ile Tyr Ala Val Tyr Met Asp Gln Leu  
 1 5 10  
 ccg gaa gcc ggt caa ttt aac cga atg atg gcc atg gtg tct gaa gaa 581  
 Pro Glu Ala Gly Gln Phe Asn Arg Met Met Ala Met Val Ser Glu Glu  
 15 20 25  
 aag cga aaa aaa gtg ggc aga tac aga tat ccc gaa gat gcc agc cgg 629  
 Lys Arg Lys Lys Val Gly Arg Tyr Arg Tyr Pro Glu Asp Ala Ser Arg  
 30 35 40  
 acg ctg atc gga gaa gtg ctg gcg agg cac atc atc agc gaa acg ttt 677

Thr	Leu	Ile	Gly	Glu	Val	Leu	Ala	Arg	His	Ile	Ile	Ser	Glu	Thr	Phe													
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cat	ttg	ccg	aat	gag	cag	atc	cgt	ttt	aca	gaa	gga	agg	tac	ggc	aaa	725												
His	Leu	Pro	Asn	Glu	Gln	Ile	Arg	Phe	Thr	Glu	Gly	Arg	Tyr	Gly	Lys													
60					65				70						75													
ccg	gct	gct	gaa	ggt	ctg	aac	gac	ttt	cat	ttc	aac	att	tcc	cac	tcc	773												
Pro	Ala	Ala	Glu	Gly	Leu	Asn	Asp	Phe	His	Phe	Asn	Ile	Ser	His	Ser													
				80					85					90														
gga	aaa	tgg	atc	gtg	tgc	gga	gcc	ggc	gcg	cag	ccg	atc	gga	gtg	gat	821												
Gly	Lys	Trp	Ile	Val	Cys	Gly	Ala	Gly	Ala	Gln	Pro	Ile	Gly	Val	Asp													
			95					100					105															
gtc	gaa	aag	atc	aag	ccg	atc	aat	ttc	gac	att	gcc	aaa	cgg	ttt	ttt	869												
Val	Glu	Lys	Ile	Lys	Pro	Ile	Asn	Phe	Asp	Ile	Ala	Lys	Arg	Phe	Phe													
		110					115					120																
tca	cct	tcc	gag	cac	gat	gat	ctc	atg	gaa	aag	gac	gaa	tca	gaa	cgc	917												
Ser	Pro	Ser	Glu	His	Asp	Asp	Leu	Met	Glu	Lys	Asp	Glu	Ser	Glu	Arg													
	125					130					135																	
ctg	tcg	tat	ttc	tat	cat	ttg	tgg	acg	atg	aaa	gaa	agc	ttt	att	aaa	965												
Leu	Ser	Tyr	Phe	Tyr	His	Leu	Trp	Thr	Met	Lys	Glu	Ser	Phe	Ile	Lys													
140					145					150					155													
cag	gcg	gga	aaa	ggc	ctg	tct	ctg	ccg	ctt	gat	tcc	ttc	tcc	gtc	aaa	1013												
Gln	Ala	Gly	Lys	Gly	Leu	Ser	Leu	Pro	Leu	Asp	Ser	Phe	Ser	Val	Lys													
				160					165					170														
ctg	aac	gaa	cag	ggg	cga	gct	tcg	gtg	gaa	act	ccc	ccc	ggc	tat	ccg	1061												
Leu	Asn	Glu	Gln	Gly	Arg	Ala	Ser	Val	Glu	Thr	Pro	Pro	Gly	Tyr	Pro													
			175					180					185															
cct	tgc	tat	ata	caa	gcc	tat	gaa	att	gac	ccc	ggc	tat	aaa	atg	gcg	1109												
Pro	Cys	Tyr	Ile	Gln	Ala	Tyr	Glu	Ile	Asp	Pro	Gly	Tyr	Lys	Met	Ala													
		190					195					200																
gtg	tgt	tcc	gcc	gca	cct	gaa	ttt	ccc	ggc	cgg	att	gtg	atg	aaa	agc	1157												
Val	Cys	Ser	Ala	Ala	Pro	Glu	Phe	Pro	Gly	Arg	Ile	Val	Met	Lys	Ser													
	205					210					215																	
tgc	gct	gaa	ctg	tca	atg	ctt	taaaaagtcc cgccctaaaa ataagcgggt									1208												
Cys	Ala	Glu	Leu	Ser	Met	Leu																						
220					225																							
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gtattgattt	tcaatagatt	tcttttttga	aaagccggca	tataatgagc	gttgaccggt													1328										
tcgagcagga	cgtcccgttt	ttgtaggctt	ttaatcagac	gggatgccgg	gatcgtccgg													1388										
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cctagagacg	cggaacattc	ttttagcaga	tcatgcagaa	ggcatgatct	tttttgatag													1508										

gaagaacgga tcttttgctt atgcttttca aacatcccg ctttcaaata gatctccaaa 1568  
gcggcctgag acagcatgga actgtcaatg tcgagcagct gtttgtagcg gttgaacaca 1628  
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<213> Bacillus licheniformis

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20 25 30

Gly Arg Tyr Arg Tyr Pro Glu Asp Ala Ser Arg Thr Leu Ile Gly Glu  
35 40 45

Val Leu Ala Arg His Ile Ile Ser Glu Thr Phe His Leu Pro Asn Glu  
50 55 60

Gln Ile Arg Phe Thr Glu Gly Arg Tyr Gly Lys Pro Ala Ala Glu Gly  
65 70 75 80

Leu Asn Asp Phe His Phe Asn Ile Ser His Ser Gly Lys Trp Ile Val  
85 90 95

Cys Gly Ala Gly Ala Gln Pro Ile Gly Val Asp Val Glu Lys Ile Lys  
100 105 110

Pro Ile Asn Phe Asp Ile Ala Lys Arg Phe Phe Ser Pro Ser Glu His  
115 120 125

Asp Asp Leu Met Glu Lys Asp Glu Ser Glu Arg Leu Ser Tyr Phe Tyr  
130 135 140

His Leu Trp Thr Met Lys Glu Ser Phe Ile Lys Gln Ala Gly Lys Gly  
145 150 155 160

Leu Ser Leu Pro Leu Asp Ser Phe Ser Val Lys Leu Asn Glu Gln Gly  
165 170 175

Arg Ala Ser Val Glu Thr Pro Pro Gly Tyr Pro Pro Cys Tyr Ile Gln  
 180 185 190

Ala Tyr Glu Ile Asp Pro Gly Tyr Lys Met Ala Val Cys Ser Ala Ala  
 195 200 205

Pro Glu Phe Pro Gly Arg Ile Val Met Lys Ser Cys Ala Glu Leu Ser  
 210 215 220

Met Leu  
 225

<210> 21  
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 <212> DNA  
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 atgtcagcga tttagaaggg cgggtcaattg aagccgatac ggccgccttg atggaagcca 180  
 acaaggacaa tgaatatatg aaaatcaaga cggttgccga tggcatcgct aaaaagatga 240  
 cagcctatta ttcttacttt gtcaatcttg tccatcaagg aacggtcagc tcggagattc 300  
 atttgatcaa atcagagcac gcaaaaccgc tcccggcatg gctttcgttg tggaaagaag 360  
 gaacggagtc ttcatatgat gaatatcaag gcgctggaag acatgatgaa atgcttgcgg 420  
 acggctttgt taaaagcaac gcagatctca tcagacagat tttgggcgaa cgtgccgctg 480  
 taatcggagg tgcgatgatgc atg aac gag atc att aag cag ttt gga gcg ccg 533  
 Met Asn Glu Ile Ile Lys Gln Phe Gly Ala Pro  
 1 5 10  
 gca agc ggt atg cag ttg atc tgt ttc ccg ttt gcc ggg gga tat tcg 581  
 Ala Ser Gly Met Gln Leu Ile Cys Phe Pro Phe Ala Gly Tyr Ser  
 15 20 25  
 gca tca ttc aga ccg ctt cac gaa cat tta aaa aca gat ttt gat atg 629  
 Ala Ser Phe Arg Pro Leu His Glu His Leu Lys Thr Asp Phe Asp Met  
 30 35 40  
 ctg gcg atc gaa ccg cct gga cac ggc aca aat cga atg gcg ctt gtc 677



Leu	Ala	Ile	Glu	Pro	Pro	Gly	His	Gly	Thr	Asn	Arg	Met	Ala	Leu	Val		
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gac	aat	ttg	gaa	aag	ctc	gcc	gat	ttg	tat	ata	gcg	gcg	ctt	aag	ccg	725	
Asp	Asn	Leu	Glu	Lys	Leu	Ala	Asp	Leu	Tyr	Ile	Ala	Ala	Leu	Lys	Pro		
60					65				70					75			
cgg	ctt	tcc	tct	caa	ttc	gtg	ctg	ttc	ggc	cac	agt	atg	ggc	ggc	atg	773	
Arg	Leu	Ser	Ser	Gln	Phe	Val	Leu	Phe	Gly	His	Ser	Met	Gly	Gly	Met		
				80					85					90			
gtt	gtt	tac	agg	ctg	gcg	caa	aag	ctt	gaa	caa	gaa	ggg	atc	ttt	ccg	821	
Val	Val	Tyr	Arg	Leu	Ala	Gln	Lys	Leu	Glu	Gln	Glu	Gly	Ile	Phe	Pro		
			95					100					105				
gca	gcc	gct	gtg	ata	tca	gcg	ata	cag	ccg	ccc	cat	att	cag	cgg	caa	869	
Ala	Ala	Ala	Val	Ile	Ser	Ala	Ile	Gln	Pro	Pro	His	Ile	Gln	Arg	Gln		
			110				115					120					
aag	gtg	tct	cac	caa	aag	gat	gac	gca	ttt	ctc	gac	cat	ctc	att	cag	917	
Lys	Val	Ser	His	Gln	Lys	Asp	Asp	Ala	Phe	Leu	Asp	His	Leu	Ile	Gln		
	125					130					135						
ctt	ggc	gga	ata	ccc	aaa	gaa	ctg	gca	gag	cac	agg	gaa	atg	atg	aac	965	
Leu	Gly	Gly	Ile	Pro	Lys	Glu	Leu	Ala	Glu	His	Arg	Glu	Met	Met	Asn		
140					145					150					155		
ttt	ttc	ctg	cct	tcg	ttc	aga	gcg	gac	tac	aga	gcg	ctt	gag	acg	ttc	1013	
Phe	Phe	Leu	Pro	Ser	Phe	Arg	Ala	Asp	Tyr	Arg	Ala	Leu	Glu	Thr	Phe		
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tgc	cat	acc	gat	cat	acg	ccg	ctt	aga	tcg	cct	gtg	cat	att	ctg	aac	1061	
Cys	His	Thr	Asp	His	Thr	Pro	Leu	Arg	Ser	Pro	Val	His	Ile	Leu	Asn		
			175					180					185				
gga	gac	cgc	gat	gag	aaa	tgc	atg	agg	gat	gcg	ctt	ggc	tgg	aaa	aag	1109	
Gly	Asp	Arg	Asp	Glu	Lys	Cys	Met	Arg	Asp	Ala	Leu	Gly	Trp	Lys	Lys		
		190					195					200					
tgg	gcg	aat	acg	atc	gat	ttc	cac	tat	ttc	aaa	ggc	gga	cat	atg	tat	1157	
Trp	Ala	Asn	Thr	Ile	Asp	Phe	His	Tyr	Phe	Lys	Gly	Gly	His	Met	Tyr		
	205					210					215						
ctt	tta	tca	gaa	acg	gaa	caa	gta	gcc	gcc	aag	ttg	aaa	acg	att	gcc	1205	
Leu	Leu	Ser	Glu	Thr	Glu	Gln	Val	Ala	Ala	Lys	Leu	Lys	Thr	Ile	Ala		
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gcg	gcc	agc	cgc	agt	acg	gct	gtt	ccg	aca	atg	taaagaaagc	ggaaaaatcgg	1258				
Ala	Ala	Ser	Arg	Ser	Thr	Ala	Val	Pro	Thr	Met							
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Leu His Glu His Leu Lys Thr Asp Phe Asp Met Leu Ala Ile Glu Pro  
 35 40 45

Pro Gly His Gly Thr Asn Arg Met Ala Leu Val Asp Asn Leu Glu Lys  
 50 55 60

Leu Ala Asp Leu Tyr Ile Ala Ala Leu Lys Pro Arg Leu Ser Ser Gln  
 65 70 75 80

Phe Val Leu Phe Gly His Ser Met Gly Gly Met Val Val Tyr Arg Leu  
 85 90 95

Ala Gln Lys Leu Glu Gln Glu Gly Ile Phe Pro Ala Ala Ala Val Ile  
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Ser Ala Ile Gln Pro Pro His Ile Gln Arg Gln Lys Val Ser His Gln  
 115 120 125

Lys Asp Asp Ala Phe Leu Asp His Leu Ile Gln Leu Gly Gly Ile Pro  
 130 135 140

Lys Glu Leu Ala Glu His Arg Glu Met Met Asn Phe Phe Leu Pro Ser  
 145 150 155 160

Phe Arg Ala Asp Tyr Arg Ala Leu Glu Thr Phe Cys His Thr Asp His  
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Thr Pro Leu Arg Ser Pro Val His Ile Leu Asn Gly Asp Arg Asp Glu  
180 185 190

Lys Cys Met Arg Asp Ala Leu Gly Trp Lys Lys Trp Ala Asn Thr Ile  
195 200 205

Asp Phe His Tyr Phe Lys Gly Gly His Met Tyr Leu Leu Ser Glu Thr  
210 215 220

Glu Gln Val Ala Ala Lys Leu Lys Thr Ile Ala Ala Ala Ser Arg Ser  
225 230 235 240

Thr Ala Val Pro Thr Met  
245